Electrical World

SEPTEMBER 15, 1945

ONE-FLOOR OPERATION

Featuring HOW'S BUSINESS? A survey of electrical manufacturers covering—production • shipments • stocks • orders • prices • designs

ALSO—First Results of Georgia Better Home Towns Programs

WHEN YOU'RE READY TO PICK UP THE YEARS YOU'VE SKIPPED

WESTON CAN TELL YOU LOTS

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Historic Trip Made Possible by OKONITE Cable that Fed POWER and OIL to Submersible Pumps

P.O. Box
LOS ANGELES, CALIFORNIA

(Use dispatch phraseology)

BYRON JACKSON 6" ELECTRIC SUBMERSIBLE SALVAGE PUMPS PLAYED AN IMPORTANT ROLE IN THE SAVING OF THE CRUISER USS HONOLULU, VETERAN OF TEN BATTLES, WHEN SHE WAS HIT BY A JAPANESE AERIAL TORPEDO WHILE BOMBARDING SHORE INSTALLATIONS IN SUPPORT OF THE LEYTE IN-VASION. THE FINE PERFORMANCE OF THESE PUMPS IN DEWATERING THE CRUISER'S FLOODED COMPARTMENTS, COUPLED WITH AN EFFECTIVE DAMAGE CONTROL JOB, EN-ABLED HER TO COME HOME 12,000 MILES UNDER HER OWN POWER FOR REPAIRS. THE BUREAU EXTENDS THANKS AND COMMENDATION BOTH FOR YOUR EXCELLENT PRODUCTION REC-ORD AND FOR THE RESEARCH AND DEVELOPMENT EFFORT WHICH MADE THIS VITAL EQUIPMENT AVAILABLE TO THE NAVY.

E. L. Cochrane

E. L. COCHRANE
VICE ADMIRAL, USN
CHIEF OF BUREAU OF SHIPS

Originator's Telephone Branch No. 8878 BUREAU OF SHIPS SPEEDLETTER

U.S.S. "Honolulu" gets "First Aid" at Leyte

• At a time when naval salvage was of the highest importance to final victory, a story was disclosed which involved high engineering ingenuity as well as a crew's devotion to duty. It is the account of a voyage of nearly half-way across the world by a never-say-die cruiser which had been hit by an aerial torpedo at Leyte – the U. S. S. "Honolulu".

In a letter reproduced here, Vice-Admiral Cochrane cites the performance of the submersible salvage pumps of the Byron Jackson Company. These pumps are served by unusual "double duty" Okonite cables, furnishing not only necessary power but necessary oil at the same time.

In the research and development mentioned by the Admiral, Okonite engineers cooperated closely with those of Byron Jackson. As a result a cable construction was developed which is water-tight from without, oil-tight from within, combining excellent electrical properties with thorough protection against leaks. Each submerged pump's electric motor operated within an oil bath maintained under pressure through a tube incorporated in the multi-conductor neoprene sheathed Okonite electric cable.

Okonite engineers are always available for consultation with design engineers and others in solving unusual problems of electrical power transmission and distribution by the development of cable assemblies specially manufactured for the service under discussion. The Okonite Company, Passaic, New Jersey.

This 1½" diameter Okonite submersible pump cable has:

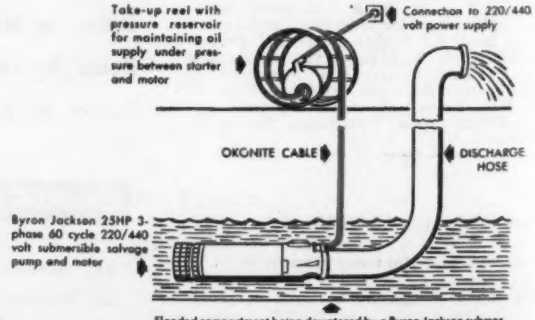
(a) 3 Okoloy-coated copper conductors size 3 AWG with 5/64" varnished cambric insulation on each

(b) 2 Okoloy-coated copper bare neutral conductors

(c) 1 flexible copper tube with paper wrap

(d) 4 Okoprene oil-resistant coated tapes wrapped over the twisted core for mechanical strength

(e) Protective sheath of solid Okoprene over all


Take-up reel with pressure reservoir for maintaining oil supply under pressure between starter and motor
Connection to 220/440 volt power supply
OKONITE CABLE
DISCHARGE HOSE
Byron Jackson 25HP 3-phase 60 cycle 220/440 volt submersible salvage pump and motor

Flooded compartment being dewatered by a Byron Jackson submersible salvage pump. Its electric motor operates within a sealed oil bath maintained under pressure through a tube incorporated in the multi-conductor neoprene-sheathed Okonite electric cable which supplies power to the motor.

OKONITE insulated wires and cables

Electrical World
SEPTEMBER 15, 1945

The President's Program

THOUGH THE VOICE was that of Harry, the hand was that of Franklin. True to his word when he succeeded to office, the President in his first message to Congress on peace-time legislative needs has tried to carry out the Roosevelt policies. In fact, some commentators went so far as to say that, if anything, he was more New Deal than his predecessor.

Nevertheless, throughout the message ran a new note that had been missing since 1932—encouragement to business. "To provide jobs," said the President, "we must look first and foremost to private enterprise. Government must inspire enterprise with confidence."

Under such a policy, a liberal program need cause considerably less anxiety on the part of business and industry than even a less radical program, but based upon restriction, regulation and government competition. In fact, a liberal policy that looks to enterprise for leadership, and that is cooperative and not regimentive, ought to find business and industry in a very receptive mood. Ahead of us are some of the greatest problems we ever faced, the solution of which will require new and courageous thinking.

When we come to the power program, however, we are not certain that the Administration offers the same encouragement to private enterprise that it does to other businesses. Valley developments in the Northwest, California and along the Missouri and Arkansas are recommended, with TVA cited as the example which has "inspired regional resource development throughout the entire world."

With the attitude that the President has shown to business generally, this may be a challenge to the private power industry to demonstrate what it as free enterprise can do to aid the Administration's program if the power from the river developments is sold through the established industry.

Members of Congress do not appreciate what the private power industry has done to develop not only regions but the whole country. There are some, of course, who are out and out public power advocates, but by and large they are in favor of helping private investment wherever they can be shown that it is deserving.

With its great war record behind it, the industry comes to Congress with a much better background than it did when previous regional development bills were passed. However, that in itself will not be enough. The industry should be able to show how it can be an active agent in furthering the President's program for full employment and what it can contribute to improved regional economy if it has the marketing of the power.

It is fortunate that the industry now has a Washington agency that can present its case openly. The first task which the new National Association of Electric Companies will have will not be easy but with the friendly-to-business attitude of the Administration there is at least more encouragement to make the full effort. Success can be achieved if the members of the House and Senate can be convinced not only that the industry has the ability to bring to a region the full benefits from the government-generated power but vision that is far reaching and sincerity of desire to see the program prosper.

Better Home Towns Program Getting Results in Georgia

To make towns in the state better places to live in, to which service men will be happy to return, and where the younger generation will be content to remain, is aim of state improvement program originated and promoted by Georgia Power Co.

***H. A. SMEETON**, Planning Supervisor, Better Home Towns Division, Georgia Power Co., Atlanta*

BELIEVING that the success of an electric utility lies in the continued progress of the territory it serves, that the progress of the territory is wholly dependent on the growth of the individual communities contained in it, and that the Southeast has brighter prospects for industrial and social development after the war than almost any other section of the nation, the Georgia Power Co. decided to take action in the premises. And the Georgia Better Home Towns Program came into being in July, 1944. Conceived as a wartime program for peace-time progress by Charles A. Collier, vice-president of the company, it is now continuing into the post-war days with a most encouraging record of accomplishment already chalked up. (see opposite page)

In mind as the idea of the program took shape were certain specific things. How Georgia's prospects also seemed bright after the first World War, and how, instead of realizing that promise, the state had slumped into a depression that lasted for many years. The fact that Georgia's per capita income was fifth lowest in the nation, her literacy record about as bad and, as a consequence of these and other factors, she has lost many of her best-trained youths and citizens to other states that offered more promising opportunities. One out of every four native-born Georgians, approximately one million people who were born there, live outside the state. No area, no state, no nation can continue to "export" its most valuable asset (its young people) and survive.

AIMS OF THE FIVE-STAR BETTER HOME TOWN

- ★ Attractive employment for returning service men and war workers and for present and future citizens.
- ★ Promising opportunities for the advancement of all.
- ★ Comfortable living conditions for citizens and visitors.
- ★ Modern schools and good churches.
- ★ Pleasant recreational and social facilities.

The objectives of these aims are:

To keep the young people in the home community and to attract new residents.

To bring more business to the town and more farm prosperity to the section.

To expand existing industries and attract new ones, especially small ones locally owned and financed.

To attract more tourist trade.

The problem was to keep Georgians at home, and that called for a better home town, where opportunities existed for fair living and advancement, pleasant social life, increasing prosperity for the town and the area.

The returning serviceman must be induced to remain in his own home town upon his return; his skills, his imagination and his earning and buying power are vital to the success of the town! Too often, reference to returning veterans is couched in terms that infer they are a liability; "this must be done for them"; "that must be done"; "a job must be provided"; they constitute a "problem" that must be dealt with; they are a "liability" that we are saddled with whether we like it or not. On the contrary, they are an invaluable asset to the progress of the community, the area, and the state. If there be a debt, that debt is to ourselves to see that everything possible is done to influence the returned veteran to again take up his civilian life in our midst, to provide him at home with opportunities for advancement, instead of having him wander off to other parts of the country where opportunities may be brighter. Georgia needs him a whole lot more than he needs Georgia.

The territory served by the Georgia Power Co. is predominantly rural. It is composed of a majority of towns in the "under one thousand population" class. The following table shows the numbers of towns by population:

Over 10,000	19
2,500 to 10,000	48
1,500 to 2,500	50
1,000 to 1,500	43
500 to 1,000	113
400 to 500	41

From this it will be seen that a program, to be successful, must be geared to those many smaller communities served by the company. It must also be designed so that every man, woman and child in the community, black and white, can participate. Too many post-war plans are confined to the activity of only a few of the leaders in the community, the great majority of the townspeople have no part in the planning, no voice in the decisions, and no active participation in the work. The greatest possible participation by the greatest number of people is essential to success.

As a possible solution to these problems, and with all of the basic factors necessary to a successful plan in mind, the Georgia Better Home Towns Program was born.

In its component parts, the program is not original. Nor does the Georgia Power Co. claim any proprietary rights to the plan. Possibly unique only in its "packaging," it is offered to any community in the company's territory and, upon its adoption by that community, becomes the property of the community, either as the Townsville Better Home Towns Program, or by any other name they may choose. The program does not duplicate the efforts of any committee already engaged in post-war planning for the community. To such a group, the plan is offered "in whole or in part" for such ideas as it may contain to augment their present activity.

The program, in its initial stages, is a simple plan that everyone can understand and for which most people can understand the need. Some may think it's too simple, some are inclined to doubt that such prosaic things as cleaning up a junk yard, or planting some new shrubbery in the town square, can make any appreciable difference in the progress of a community. But a people may become accustomed to unsightly surroundings through too long association with them. So accomplishment of simple projects leads to civic pride; more ambitious projects will be undertaken and, finally, community betterment takes a foremost place in the minds of the community leaders and citizens.

Getting Started

The program was first announced at the annual meeting of the Georgia Press Association in July of 1944. Representatives of most of the newspapers in Georgia were in attendance and the tremendous amount of favorable publicity, by all of the newspapers in every part of the company's territory, testifies to the unanimous approval of the plan. Coincident with the presentation to the Press Association, the company announced a letter-writing contest on "Five Ways to Make My Community Better." The contest was open to everyone except company employees and entries were divided into two classes, those who were over and those who were under eighteen years of age. Identical prizes were offered in both classes amounting to a total of $5,200 in war bonds and stamps. All entries were segregated by the county in which the contestant lived, and the letters were first judged at the county level. Many of the counties created prize set-ups for county winners. The best of the letters from each county were then advanced for consideration for the awards offered by the company.

The letter-writing contest served a two-fold purpose. At a time when interest in the new program was most needed, it created a fuller knowledge of the plan than could have been ob-

FIRST RESULTS ARE SHOWING, MORE COMING!

There are 150 "Paint-Up Clean-Up" campaigns being conducted . . . 30 more to be presently started.

Work on new public buildings has been actually started (some completed) in 11 communities . . . 21 more still in the planning stage. In 25 communities repairs have been made to their public buildings, while in 28 others they have improved the appearance of the City Hall or Court House with new shrubbery and grass.

New parks, or major improvements to existing municipal parks, have been completed in 46 towns. Recreational centers have been completed in 47 communities and 43 more are presently to be started . . . containing proper playground equipment, many of them lighted and including ball diamonds, tennis courts, swimming pools, and the like.

Extensions to street and sidewalk paving have been effected in 37 towns, and 53 other towns have that as their next "order of business."

New or improved water and/or sewage systems have been started in 37 communities . . . many of them finished . . . and 85 other towns have that on the list of objectives.

Public rest rooms and comfort stations have been installed in 7 communities . . . 72 more towns will have them when materials become available.

Additions and/or major improvements have been made to school properties in 27 communities . . . 34 others have similar projects.

In 46 communities the BHT Committees have been instrumental in effecting improvements in the municipal services rendered . . . improved garbage collection facilities, increased fire protection, police protection, new street-cleaning equipment, and the passing of, or the enforcement of existing, sanitary regulations and ordinances.

New or extended street lighting has been completed in 12 communities, and is being planned in 22 more.

Housing projects (with a view to both slum clearance and increased facilities) have been completed in 17 communities . . . 44 more are still working on their plans.

The youths of 53 communities have been benefited by the creation of that many "Teen-age Clubs," or similar youth centers, and more new ones are being opened every week.

A total of 70 communities have campaigns of "improvement planting," throughout the whole community, actively in progress . . . 56 more want such a campaign but haven't yet perfected their plans.

New bus stations . . . 5 now, 14 later. Improvements to railroad stations, with beautification of the rights-of-way approaches . . . 8 completed, 11 still in the planning stage.

Installation of public health clinics . . . 15 opened, 17 more on the way. New hospitals, or major expansions to provide more beds, . . . 9 already functioning, 19 similar projects for "after the war."

A total of 95 communities are dismantling old, vacant, and unsightly buildings and are engaged in a program of store improvement for the business section.

Rat extermination campaigns have been conducted in 20 towns.

The citizens in 22 communities have effected major improvements to their church buildings and grounds.

New libraries have been opened in 10 locations.

There are 8 new hotels in the territory.

Committee have created 6 new farmer's markets and 7 others are still working on this.

There are 30 communities that have already started doing something about attracting tourist trade . . . by restoration of historic sites, better access roads, suitable markers, information folders, and not forgetting, of course, the matter of good places to eat, restful places to spend the night, plus the necessity of improving the appearance of the town.

tained by possibly any other means. In itself that was sufficient justification for the work and expense involved. It has now been indicated that the analysis of all of these letters, made by a staff of independent experts, provides the local BHT committee with valuable information and material on what is most needed in Georgia communities. "The people have spoken," 7,027 of them, and many budget appropriations were approved by finance committees on the strength of that "spoken word."

Meanwhile, the story of the program was being told at meetings of leading citizens all over the state. Everyone who heard the story was enthusiastic, not one dissenting vote was cast. All agreed that it was a practical, down-to-earth, workable program. While enthusiasm was at its height, key men in the community were urged to organize their committees, take action at once toward making their town a better home town.

Local Organizations

The purpose of this committee was to provide leadership, leadership in community progress for the betterment of all its citizens. It was suggested that the committee should be composed of leading businessmen, farmers, newspaper editors, educators, leaders of the various women's organizations, and the like. Its first task would be a thorough and conscientious study of the assets and liabilities of the community to find out the facts about it, good and bad, and face them frankly. The next thing would be to find the objectives for making the town better. And the third to set up specific objectives for making the community a "Five Star Better Home Town" in the light of the facts.

To carry out the work of the program the company formed a new division of the sales department to deal solely with this work. While all members of the department are more or less involved with some phase of the work, home service in contacting the woman's clubs, commercial lighting men offering advice on improved store fronts and window lighting, power sales suggesting necessary equipment and adaptation of power for new, small industries. One representative in each of the company's six operating divisions is primarily responsible, under the division sales supervisor's direction, for the progress of the plan. The BHT division also includes two general office representatives, a field supervisor and a planning supervisor, under the personal direction of the vice-president in charge of sales. Preparation of material, continued publicity, and suitable displays for company stores is in the capable hands of the advertising department.

The division BHT representative correlates the activities of the other branches of the sales department with the work of the program, continues a close contact with district and local managers of the company, and with them, attends meetings of the locally formed committees. Wherever and whenever possible, he presents the story of the program to groups in those communities where no committee has yet been formed.

He is provided with a wealth of material as "tools" with which to work. A full complement of booklets has been produced, covering each phase of the program, with large and small visualizers, slides and other projection material, together with a projection machine and screen for his use and more and more material is constantly being added to his library. On the formation of a committee, he presents to each member a personalized binder (with that member's name hand-lettered on the binder) containing copies of the various booklets for his use and guidance. Com-

DOWN-TO-EARTH SUGGESTIONS FOR GEORGIA TOWNS

First ideas and suggestions for the local program are of the simple, down-to-earth variety. For Instance: Does the appearance of your town need improvement? Do the stores, homes and public buildings need cleaning? Do they need painting? Would flowers, shrubbery, grass and shade trees enhance the appearance of these structures, and the public streets and parks? Do junk piles, ugly signs, and dilapidated buildings mar the highway and railroad approaches to the town?

A clean, attractive community is inviting to tourists! The State of Georgia lies in the direct path of vacationists and tourists motoring to and from Florida. A survey indicates that $150,000,000 can be added annually to the income of Georgia citizens from the tourist trade alone. To attract their trade, however, they must be provided with good places to eat, restful places to spend the night, some pleasant places of amusement, historical points of interest properly marked . . . and no state in the Union can boast of a greater historical background . . . and efficient, courteous automotive service. Can your community supply these wants?

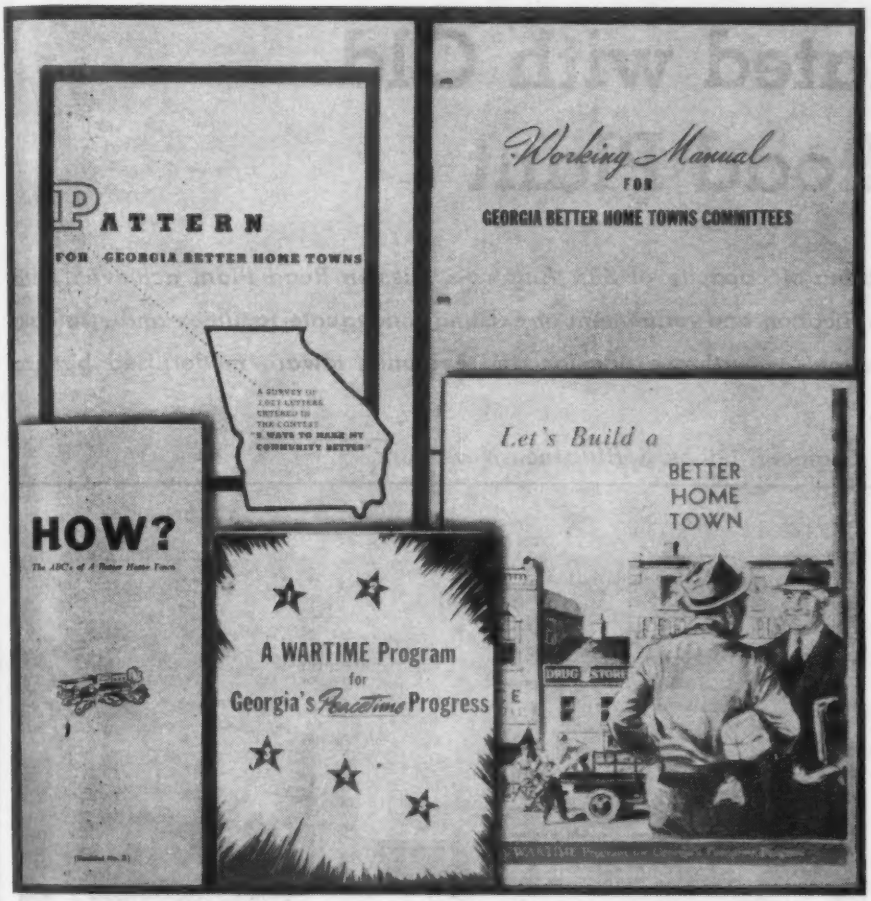
What about the service establishments in your town? Are there enough of them for your size and needs? To mention only a few . . . how about laundries and dry cleaning, shoe repair, appliance and radio repair, plumbing, cabinet shop, tinsmith . . . and a host of others? Remember that boys have been well trained while in the Armed Forces. They now have the necessary skills and can, if properly encouraged, obtain the money (under the G. I. Bill of Rights) to establish themselves in one or more of these businesses. Would such service establishments be one of the means whereby your returning servicemen could be induced to stay at home?

What about the farm families in your community area? Does your town invite as much of their trade as possible . . . include them in community activities . . . provide adequate public washroom facilities, and benches to rest on . . . supply them with adequate marketing space and commodity transportation facilities? Or will they drive on to some neighboring community that appears to put a greater value on their trade?

To meet local education and religious needs, does your town have good schools, good churches, a public library, an auditorium? Does your community have adequate medical, dental public health services? Remember that the boys and girls while in the Service were well fed, well housed and, if you please, well "medicated" and well "recreated" while they were away. Remember, too, that they have travelled in many far places, and they have seen what can be done in many communities to make them better home towns!

And speaking of recreation . . . does your community have adequate facilities for recreation? A properly equipped playground? A swimming pool or lake? Movies? A 'teen-age club or other suitable social meeting place for the youth of your community? Would this perhaps make for a better home town?

It is such simple things as these that make up much of the body of the program.



CONSECUTIVE SERIES of instruction booklets develops operation of program in orderly fashion, each step outlined in detail

mittee members are placed on a company mailing list and at regular intervals new ideas and suggestions, copies of new articles, and similar pertinent data are sent out as a stimulant to their imaginations.

In order to benefit from the many worthwhile suggestions that each and every employee can contribute, and to obtain the active support of the greatest possible number of employees throughout the company, division, district and local office committees have been formed. Although initiated by the sales department, the program is company-wide in its scope and interest; benefits extend to the whole company.

The division committee, along with the advisory committee, is composed of the heads of all of the departments represented in the division. Members meet jointly to discuss their plans for the program and each member encourages the active support of those within his department. Personnel of the district committee include similar representation as the division committee plus the local managers within the district. The local office committee gives each member of the staff a personal interest in, and a sense of responsibility for, the program. All committees meet once each month and emphasis is given to the fact that, in the final analysis, it is the direct responsibility of district and local managers, and the employees in those offices, to stimulate the activity of the program within their respective communities.

The system of reporting is of great importance. In this program a special file folder has been obtained and two printed forms have been designed. On the objective report all of the objectives or projects decided upon by a BHT committee are listed, a separate list for each community. Management is interested in tangible accomplishments, by which to evaluate the merit of the activity, and it can be seen that the objective report will presently contain a record, not only of intended projects but also of objectives that have now become accomplishments. The monthly progress report states simply the degree of accomplishment in each of the projects listed. Very often a single word or phrase is sufficient to report what further action has taken place since the report for the previous month was submitted. Both of these forms, together with the names of the committee members and any news items or other information pertinent to this town alone, are filed in the special folder bearing that particular town's name.

Numbers across the top of the folder relate to the extent of the activities and accomplishments of the community, and a sliding "flag" is placed to enable the interested party quickly to select: (a) The committees that seem to need help toward further progress, (b) The town that is properly organized but would seem to require some further stimulation toward turning objectives into accomplishments, and (c) That community to which one can "point with pride" as being well on the way to becoming a better home town.

Much Done in Short Time

There are, as of this writing, 225 community committees organized in the company's territory. Many, by far the great majority, have been active, working committees for less than six months! We believe that it's a great tribute to the citizens of Georgia communities that, in this short time, so many projects have been turned into accomplishments. On page 85 are listed some of the actual accomplishments resulting from the activities of communities that have adopted the program. Many projects had, of necessity, to wait until after the war when critical materials and manpower were again available. Many communities are just now getting into "full swing," with few accomplishments but many projects.

With the accomplishment of minor projects, civic leaders are emboldened to attempt undertakings which never would have been dreamed of a year ago. That "nothing succeeds like success" is being proven time and time again in many parts of the state. Georgia is not going to slump into a depression after this war, Georgia home towns are going to better home towns, many already are, in which the returning sons and daughters will be offered every encouragement, and justification, to remain. There is every indication that Georgians are awake to the merits and potentialities of the program, and are cooperating each with the other, to attain the goals of a "Five Star Better Home Town."

New Correlated with Old in Mission Road Plant

Doubling of capacity of San Antonio's Mission Road Plant achieved with simplification and refinement of existing inadequate facilities and strategic provision for further expansion and evolution toward modernized pattern

JOHN H. HOCHULI, Mechanical Engineer, Gibbs & Hill, Inc., New York

CHANGING an inadequate and partially obsolete generating station into an expanded and modern one was the task in connection with the addition of a 25,000-kw. turbo-generator at Mission Road Plant of the Public Service Board of San Antonio. Design of the extension not only contributed the added capacity but also enhanced the availability of the existing facilities. Structural details were adjusted to permit full utilization of both cranes in the present boiler and turbine room. Operating controls for both old and new station areas were consolidated at a single level.

One floor above, the turbine and boiler operating level contains individual burner controls, high pressure feedwater heaters, all high pressure valves and headers, the desuperheaters and the reducing stations. Plenty of working space for operation, overhaul and maintenance was an objective in the layout. At a single floor level (at the former main operating level) are the boiler feed pumps, condensate make-up pumps, low pressure drip cooler, etc. Provision was made for pulverizers, storage bin, ash hoppers, cinder eliminator in case it proves desirable to burn lignite in lieu of natural gas or oil which is now the standby fuel.

No water other than condensate will enter the high pressure boilers. Two large concrete water-storage tanks were built integral with the new turbine room extension to insure such control of make-up.

The electric and gas systems of the former San Antonio Public Service Co. were acquired by the City of San Antonio in October 1942, after the Securities and Exchange Commission had directed the American Light and Traction Co. to divest itself of these holdings. The systems are now operated by a Board of Trustees known as the City Public Service Board of which W. B. Tuttle is Chairman and E. H. Kifer is General Manager.

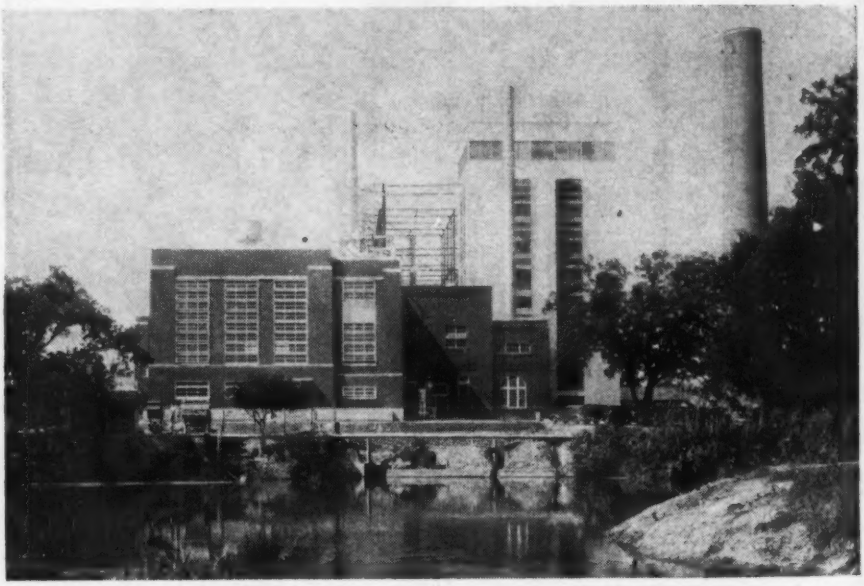


FIG. 1—New turbine room of Mission Road Plant (San Antonio) at the left, new boiler house at the right and old boiler house showing between them

Existing Facilities

The Mission Road Plant (formerly Station "B") was, prior to the installation of the new unit, the smallest of two steam generating stations supplying power to the city's electrical system, its rated capacity being about one-third of the total exclusive of purchased hydro power. The original plant consisted of low pressure (190 psi.) boilers and turbo-generators. In 1930 a high-pressure boiler (1,275 psi., 825 deg. F.) was installed together with a high-pressure turbo-generator whose exhaust passed through a reheater within the boiler and fed a 12,500-kw. low pressure (190 psi.) machine. This boiler and tandem unit were expected to produce 20,110 kw. However, the boiler unit proved incapable of producing sufficient steam continuously to meet the load requirements and could only be counted on for steam to generate 15,000 kw. to 17,000 kw.

When Gibbs & Hill, Inc., undertook redesign and reconstruction, a new 325,000 lb. per hour, 1,350-psi. operating pressure, 900-deg. F. boiler and a 25,000-kw. condensing, extracting turbo-generator had already been purchased. The problem was, therefore, twofold—first, to utilize the purchased equipment with the necessary suggested changes, and second, to arrange it so as to meet the present

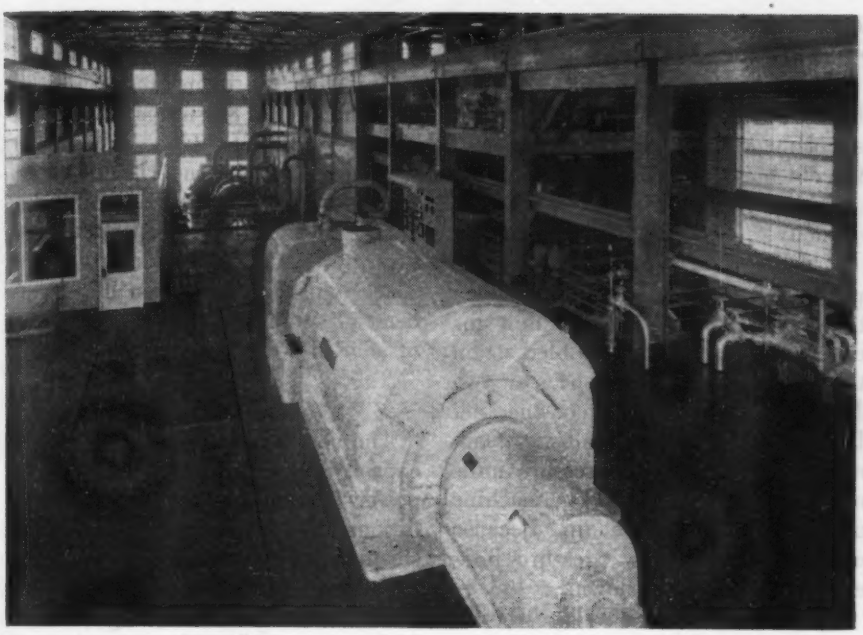


FIG. 3—The crane rails and roof were raised and then extended to permit servicing the new turbine at a higher level than the units in the existing turbine room

and future requirements of the plant.

It was decided to utilize the clear space at the north end of the old turbine room and start building just as if the plant were a new one instead of an addition. It was then possible to give proper clearances around all the machinery and auxiliary equipment for operation, inspection, and maintenance. This also aided in keeping erection costs at a minimum and prevented undue interference with plant operation during construction.

A future unit of the same size is contemplated south of the new machine. Construction difficulties will be minimized when this installation begins as all column footings and present foundations have been arranged. When future units are installed they will replace equipment in the old building south of the new wing.

The new unit required a higher roof and crane rails, therefore the roof and crane rails in the old turbine room were raised to the same level as the new addition, thus permitting the utilization of the old crane for both areas. Cost of doing this proved much less than the cost of a second crane.

Width between crane rails determined the width of the turbine room extension and that in turn governed the location of the turbo-generator in a lengthwise rather than crosswise position in the turbine room.

Turbine room heights and elevations were arrived at by matching the basement elevations in both the new and old structures to eliminate putting the new condenser in a pit. This elevates the new operating floor about 14 ft. above the present one sufficient for the condenser of any

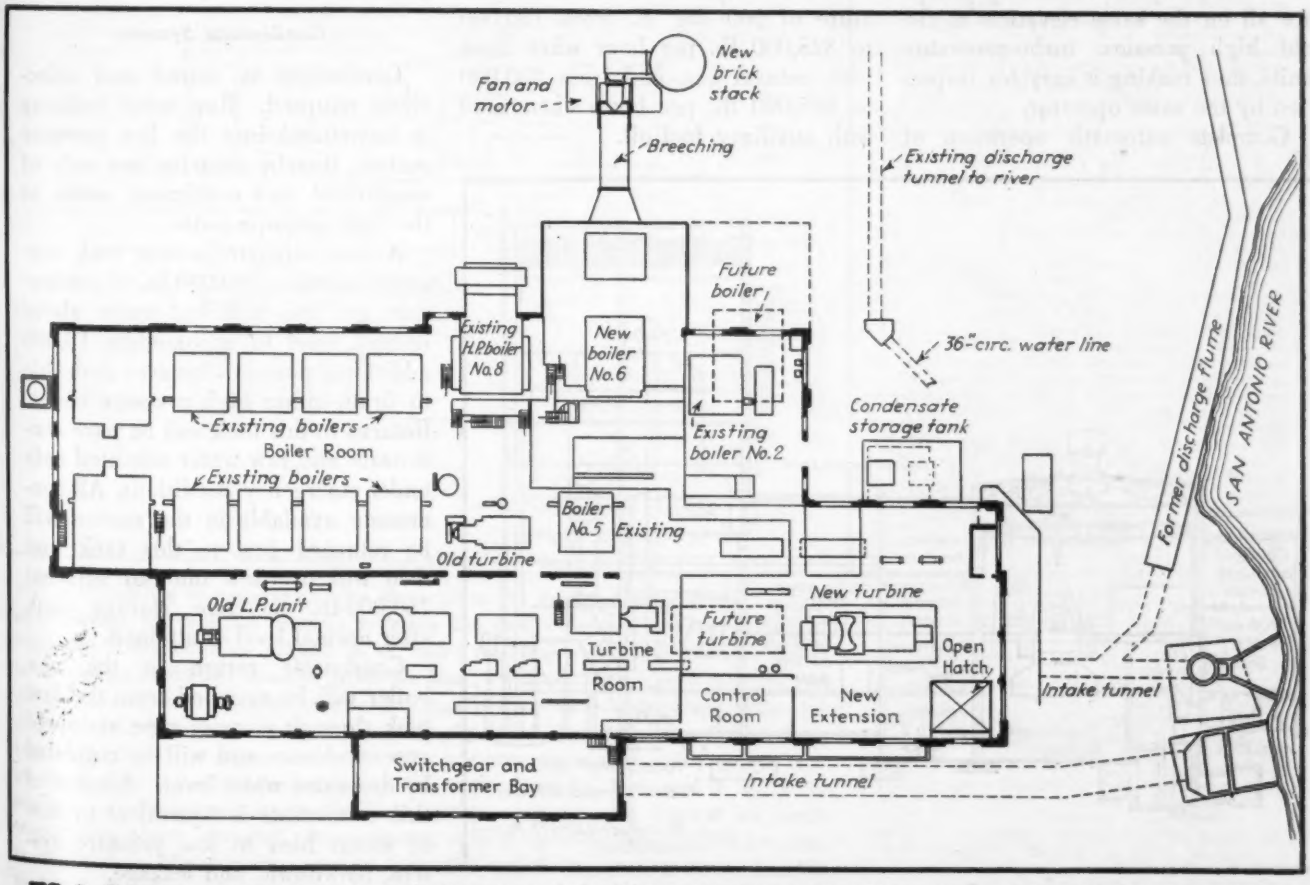


FIG. 2—Future expansion of the station will be toward the left (south). The existing high pressure turbine No. 6 is in the boiler room; its tandem low pressure mate is at the extreme left in the turbine room

probable future unit. All outgoing main electrical circuits, except outgoing circuits under supervisory control are operable from a single control located on this new floor. Boiler instrument and combustion control panels as well as the boiler feed pump board for both the new and old high pressure boilers are located directly in front of the new boiler and at the same elevation as the new turbine operating floor. This simplifies operation by placing all control points on the same level and providing ready access and communication from one to the other.

New Boiler

The new boiler was installed north of and adjacent to the old high pressure boiler.

Boiler feed pumps and feed water heaters have been installed east of the firing aisle in the location used for part of the old low pressure boilers, since dismantled and removed.

The original high pressure turbo-generator unit is in this same aisle. Its crane will be utilized for the new boiler feed pumps and low pressure heater by extending the crane rails. The feed pumps and make-up pumps are all on the same elevation as the old high pressure turbo-generator units, thus making it easy for inspection by the same operator.

Complete automatic operation of both old and new boilers was installed.

As already pointed out, the new boiler was purchased with the idea of supplementing the operation duties of the old boiler and provide additional steam to bring the tandem unit to capacity. (See Fig. 5 for flexibility afforded.) It also has additional capacity to provide 115,000 lb. of steam to the new turbo-generator unit for extraction at 190 psi. This bled steam together with that furnished by two 1,000-hp. L.P. boilers and one 500 L.P.-hp. boiler provides all the steam necessary for the low pressure units not including the 12,500-kw. machine used in the tandem set up. Because of this nine (9) low pressure boilers can now be shut down.

The new (Babcock & Wilcox) boiler is designed to deliver 275,000 lb. per hour continuously at a pressure of 1,400-lb. gage and at a temperature of 900 deg. F. with feedwater at 400 deg. F. and 325,000 lb. per hour over a 4-hour peak period at 1,350 lb. gage and 900 deg. F. with feedwater at 375 deg. F.

The attemperator furnished with the boiler unit is designed to maintain a constant superheater outlet temperature of 900 deg. F. from 130,000 to 325,000 lb. per hour when fired with natural gas, and from 200,000 to 325,000 lb. per hour when fired with auxiliary fuel oil.

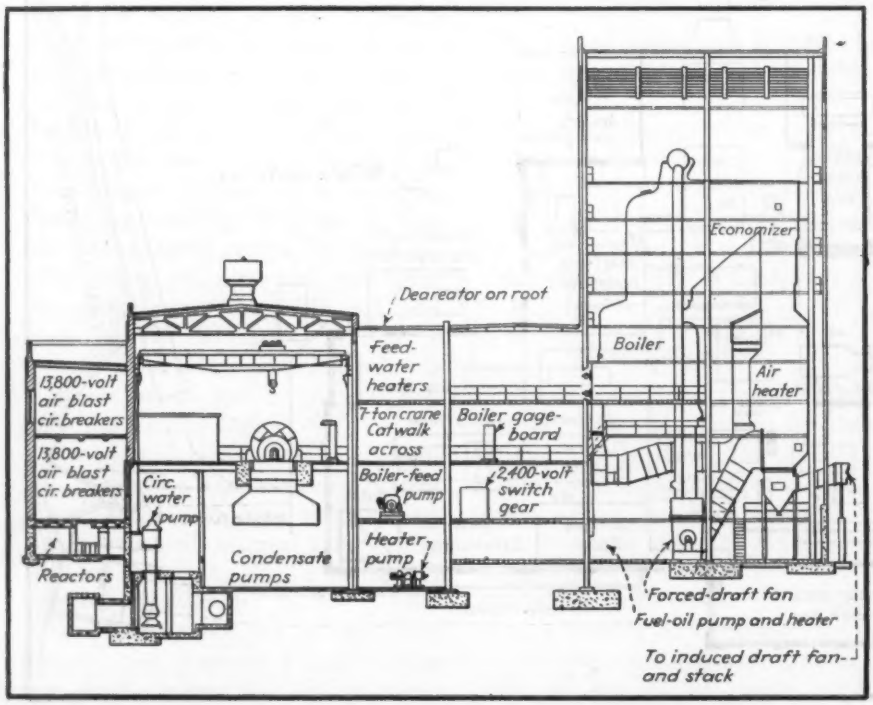


FIG. 4—All operations of major units of addition brought to a single level. Heaters, burners, desuperheaters above, pumps below

The primary or rear superheater section will receive dry saturated steam from the drum and discharge into an external 3-drum attemperator. The secondary or front superheater section will receive superheated steam from the attemperator outlet and discharge steam at the proper temperature into the main header. Adequate space is provided between the superheater sections for future installation of soot blowers if required.

Turbo-generator

The new Westinghouse turbine has capacity to carry 25,000 kw. at unity power factor with throttle steam conditions of 1,325 psig. 900 deg. F. total steam temperature, with an exhaust pressure of 2 in. mercury absolute, with extraction for heating its own feed water, and with extraction of 115,000 lb. per hour for low-pressure turbines in the plant.

Generator has capacity to carry 32,800 kva. at 76 percent power factor, or 25,000 kw. with 15-psi. gage hydrogen pressure; and 28,570 kva. at 70 percent power factor or 20,000 kw. with 0.5 psig. hydrogen. This 102-ton machine was delivered in completely assembled form.

Condensate System

Condensate is stored and selectively returned. Raw water make-up is introduced into the low pressure system, thereby assuring use only of evaporated and condensed water in the high pressure units.

A new concrete storage tank normally contains 240,000 lb. of condensate and has sufficient space above normal level to accomodate 19,000 additional pounds whenever desirable to drain either high pressure boiler. Returns to this tank will be pure condensate and raw water admitted only under emergency conditions. All condensate available in the station will be returned first to this tank and then will overflow into an adjacent 250,000-lb. concrete storage tank after normal level is attained.

Condensate return to the new boiler will be supplied from the first tank through a spray pipe at top of new condenser and will be regulated by deaerator water level. Amount of this condensate is equivalent to sum of steam bled to low pressure system, blowdown, and leakage.

Condensate make-up for the original high pressure boiler will normally

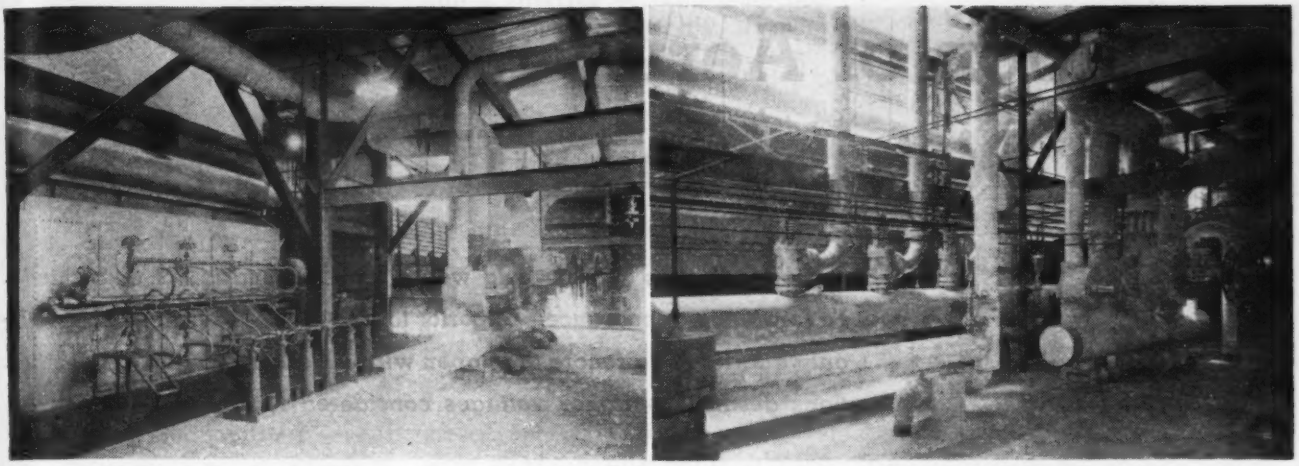


FIG. 6—Arranged all on one floor with ample working space are (left) the burner controls and (right) the high pressure headers

be supplied from the first tank mentioned and will be controlled by water level in the original deaerator.

Augmented Capacity

Maximum rated output of the plant with the new machine up to capacity will be 61,500 kw. In all probability all machines will seldom be operating simultaneously. The two high pressure boilers with their respective turbo-generator units, using one 500-hp. boiler for make-up, will produce 45,110 kw.

The new installation thus accomplishes five things:

1. Increases the plant capacity directly by adding a new 25,000-kw. machine.

2. Adds 3,000 kw. to 5,000 kw. to plant capacity by furnishing additional steam required for tandem unit.

3. Increases plant efficiency and lowers maintenance costs through elimination of nine low pressure boilers.

4. Starts a systematic program of replacement of new machinery for obsolete equipment.

5. Provides a base load plant of modern design.

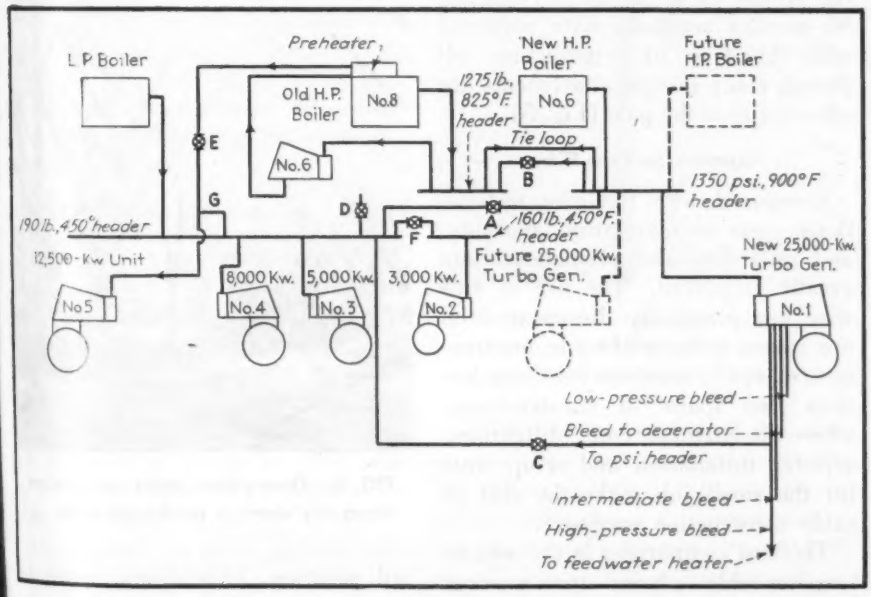


FIG. 5—Flexibility in operation at the three pressures achieved by strategic location of crossovers, headers and pressure reducing and desuperheating stations. Station A. Supplying a maximum of 273,000 lb. of steam per hour from high pressure boiler system when 25,000-kw. machine is off the line. Station B. Supplying a maximum of 30,000 lb. of steam per hour to augment supply from old high pressure boiler for maximum output from existing tandem unit. Station C. Can be set to furnish from zero to 115,000 lb. of steam per hour to the low pressure system at the proper temperature. Station D. Supplies steam at 4 psi. to the deaerator, from zero to 35,600 lb. per hour to automatically insure proper deaeration when pressure drops at low loads from turbine bleed. Station E. Desuperheater only in operation when 12,500-kw. unit is off the line. Maintains temperature from 550 deg. F. to 450 deg. F. as desired. Station F. Pressure reducing desuperheating station to supply turbo-generator No. 2. Bypass G is opened when 12,500-kw. unit is off the line

NEW EQUIPMENT—PARTIAL LIST

BOILER AUXILIARY EQUIPMENT
Turbovane Forced Draft Fan—98,500 CFM *B. F. Sturtevant Co.*
Forced Draft Fan Motors—High Speed Motor—1,200 rpm.—300 hp.—2,300 Volts—Low Speed Motor—900 rpm.—100 hp.—2,300 Volts *General Electric Co.*
Turbovane Induced Draft Fan—165,000 CFM *B. F. Sturtevant Co.*
Induced Draft Fan Motors—High Speed Motor—900 rpm.—450 hp.—2,300 Volts—Low Speed Motor—600 rpm.—125 hp.—2,300 Volts *General Electric Co.*
FEEDWATER SYSTEM
Feedwater Heaters and Drip Cooler—
No. 1 Heater—2 pass—870 sq. ft.
No. 1 Drip Cooler—1 pass—355 sq. ft.
No. 3 Heater—2 pass—1,300 sq. ft.
No. 4 Heater—4 pass—1,730 sq. ft. *Struthers Wells Co.*
No. 2 Deaerating Heater, 400,000 lb. per hour tray type *Elliott Co.*
Heater Drain Controllers *Stets Co.*
Heater Relief Valves *Manning, Maxwell & Moore, Inc. Crosby Steam Gage & Valve Co.*
2—Condensate (Hotwell) Pumps—550 gpm. each—250 ft. Head *Ingersoll Rand Co.*
2—Condensate Pump Motors—1,200 rpm.—75 hp.—2,300 Volts *General Electric Co.*
3—Make-Up Water Pump Motors—Deep Well Turbine Type—215 gpm. each—325-ft. Head *American Well Works*
3—Make-Up Water Pump Motors—1,760 rpm.—75 hp.—220 Volts *U. S. Electric Motors*
2—Boiler Feed Pumps—750 gpm. each—1,660-lb. discharge pressure—one pump driven by variable speed motor; other pump driven by constant speed motor or turbine *Ingersoll Rand Co.*
1—Boiler Feed Pump Wound Rotor Motor—1,000 hp.—2,300 Volts
1—Boiler Feed Pump Squirrel Cage Motor—3,550 rpm.—1,000 hp.—2,300 Volts *General Electric Co.*
1—Boiler Feed Pump Turbine—1,080 hp. *Terry Turbine Co.*
Feedwater Level Regulator—3 element control *Bailey Meter Co.*
METERS AND INSTRUMENTS
Boiler Meters, Recorders and Draft Gages *Republic Flow Meters Co.; Bailey Meter Co.*
Temperature Recorders *Bailey Meter Co.; Leeds & Northrup Co.; Republic Flow Meters Co.*
Fuel Oil and Water Meters *Buffalo Meter Co.*
Indicating and Recording Flow Meters *Bailey Meter Co.; Republic Flow Meters Co.*
Condensate Conductivity Recorders
CO_2 Recording Equipment *Leeds & Northrup Co.*

Evolution of Aerial Cable Distribution—III*

Aerial cable has definite field where underground is not warranted—Favorable in appearance—Superior to tree wire—Overall costs usually only quarter to half more than open wire—Standardization of specifications desirable—Higher voltages considered feasible

*GEORGE H. LANDIS,** Central Hudson Gas & Electric Corp., Poughkeepsie, New York*

USE of self-supporting cable has not been developed as a cheap substitute for open wire construction. Under conditions favorable for open wire construction, this type of construction cannot be expected to compete.

However, we feel that there is a definite field for application of aerial cable where appearence, safety, and service continuity are required at a reasonable cost, and underground construction is not warranted. Along tree-lined streets in residential areas, this type of line can be made so inconspicuous as to pass unobserved by the casual observer. A three-phase line is inconspicuous even when trees are without foliage (Fig. 1 and 2). It can be readily applied to backyards (Fig. 3). Transformer installations, with no appendages except a single cutout help make this installation neat appearing (Fig. 4). Where transformer installations are made along backyards, and all kinds of attachments (clothes lines, aerials, etc.) may appear on poles, underground oil fuse cutouts with lead-covered leads are used to completely encase the system in a grounded covering. No contact accidents have occurred with this type of construction, although many foreign attachments are often made to the pole (Fig. 5).

* Evolution of this type of cable and the performance obtained from the installations over a 15-year period were detailed in two preceding articles in ELECTRICAL WORLD, (August 18, 1945, page 84, and September 1, 1945, page 90).

** Electric Distribution Manager.

FIG. 1—Three-phase cable installation along city streets in high-class residential area; inconspicuous even when trees are without foliage

Superior to Tree-Wire

Compared with tree-wire installations, costs compare very favorably, and reliability and permanence are greatly improved. The use of tree wire has practically disappeared on our system in favor of cable construction, except in instances involving less than two spans of constructions, where the attendant costs of lightning arrester installation and setup costs for the small job make the cost of cable construction excessive.

The cost comparison in the accompanying table is based upon average tree conditions experienced in residential streets and on many highways. In a number of cases, where trimming was very heavy, initial installation costs have been found to be less than open wire construction.

Cost of Construction

Recent quotations on cable indicate that the cost of this construction may be considerably reduced. As an instance, applying a recent quotation on cable in the table would reduce the total cost of 3/c—No. 1/0 cable construction from 150 percent to 125 percent of open wire construction. A further reduction may be expected if the construction of cable can be simplified by the use of a neoprene jacket in place of our present standard practice. This should result in a reduction of 10 percent to 20 percent in cable costs, depending on size and number of cables, based on recent quotations.

FIG. 2—Three-phase cable installation along city street in residential area

As stated earlier, factors other than initial installation costs must be considered in making the determination as to whether the use of aerial cable construction is warranted. Where periodic trimming is required on open wire lines, this is eliminated entirely and an annual trimming cost of $75

FIG. 3—Three-phase cable installation through the territory of high-class residential backyards

to $150 per mile, depending on cable size, will justify the additional fixed charges on the additional cable investment. Taking into consideration appearance, permanence, greater freedom from interruption, good will due to elimination of further trimming, these factors may often favor the installation of cable.

Future Application

During the past year considerable interest in this type of construction has been shown from utilities over the entire country. Much study has been placed recently upon termination, taps, sectionalizing, and hot cable work, by some of these utilities, and progress in the use of cable will be advanced much more rapidly by such cooperative effort.

In the field of cable design, new compounds may be expected to appear when material restrictions are eased. We have now an experimental installation for one cable manufacturer of 2,500 ft. of butyl compound insulation in service at 3,600 volts phase to neutral, which shows great promise of superiority over pre-war compounds. We also expect to install in the near future, as soon as cable on order can be delivered, some 15,000 ft. of cable with Buna-S compound. This cable is being constructed with a covering of conducting neoprene, replacing both the shielding tape and outer braid, and can be supplied at a considerably lower cost than previously specified cables.

Standardization Desirable

We believe it highly desirable for the utilities interested in this type of construction to consider some standardization of specifications. Only by such a procedure can we expect the manufacturers to produce cables in sufficient quantities to provide lower costs and subsequent greater application by the utilities. If some standardization can be adopted, the cable manufacturers may be placed in a position to manufacture cable in advance for stock, resulting in better deliveries, lower costs and better products for our use.

FIG. 4—Single-phase transformer installation on a 3-phase cable line. Neat appearance of equipment on the pole

Although the cables on our distribution system are limited to operating voltages below 5,000 volts, we do not consider this a necessarily limiting value, and cables can be operated equally successfully at higher voltage. Originally, many of our installations were operated experimentally at 8,000 volts (4,800 volts to neutral) with good results. The change to the lower voltage was not made primarily due to the cable, but due to the attached open wire circuits, many of which were joint construction and many unsatisfactorily built for the higher voltage.

As the distribution voltage is raised, greater care must be used in the manufacture and handling of cables. Corona formation and subsequent corona cutting of insulation greatly increase at the higher voltages, and prevention of the probability of such action must be avoided if satisfactory performance is to be expected. That this can be accomplished by training of the line crews responsible for execution of the work has been demonstrated satisfactorily, and there appears to be no reason why this type of construction cannot be modified to operate successfully on 8, 11 and 12-kv. grounded neutral systems.

Relative Costs of Aerial Cable Construction

Single-Phase Line, Phase and Neutral Construction

	Relative Cost, Percent		
	Material	Labor	Total
Cost of standard open wire construction #4 W.P. copper conductor, 200-ft. spans. Average trimming of one tree per section	100	100	100
Cost using tree wire for phase conductor. Average span 150 feet	172	93	124
Cost using 1/c self-supporting cable 200-ft. spans	212	84	133
Polyphase Line, 3 Phase 4 Wire			
Cost of standard open wire construction 3-#1/0, 1-#2 W.P. copper conductors, 175-ft. spans. Average trimming of one tree per section	100	100	100
Cost using tree wire for phase conductors, 150-ft. spans	218	76	140
Cost using 3/c self-supporting cable 150-ft. spans	262	60	150

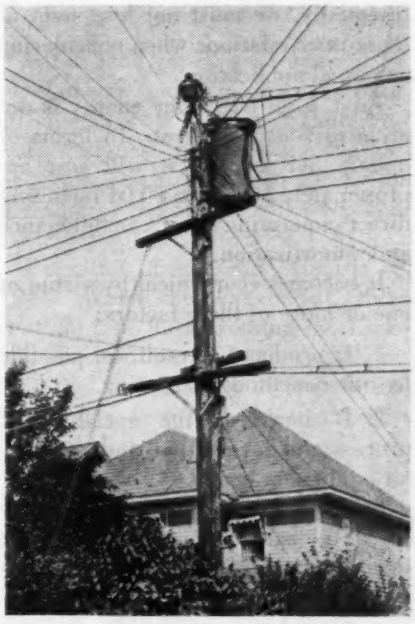


FIG. 5—Backyard cable installation. Underground oil fuse cutouts with lead-covered leads are utilized

Some Limitations of Dielectric Heating

Production economies can offset higher energy cost—Only applicable to poorly conducting material—Irregular dimensions are hard to handle—Standing waves must be avoided—Loss factor must be favorable—Promiscuous applications to be guarded against

CARL J. MADSEN, Westinghouse Electric Corp., East Pittsburgh, Pa.*

DIELECTRIC HEATING is a very useful tool in industry, one which is finding new applications every day. However, as with any tool, there are certain limitations which prevent its promiscuous application to all types of problems. By realizing these limitations, and the series of compromises often necessary, a careful analysis will permit the average electrical engineer to apply it intelligently to work which it can do well.

In reviewing the major limitations of dielectric heating that prevents universal application one must remember that almost all of them are interlocked, to some degree, one with another. Hence, in taking each individually, we must not lose sight of these inter-relations when considering an actual application.

First, high frequency energy is not a cheap source of heat. In terms of dollars per kw.-hr., it will cost approximately \$0.025 to \$0.04 including direct operating cost, maintenance and amortization.

It becomes economical by virtue of one or more of these factors:

1. It produces a result not possible by other methods of heating.
2. It increases the speed of a process and saves labor and/or overall equipment cost.
3. It produces or confines the heating in the part or point where needed, thus reducing overall power consumption.
4. It is clean and compact.
5. It reduces rejects, or improves the production quality of a product.
6. It is flexible in its application to a variety of operations, processes or products.

These factors are often of sufficient importance to make an application economically attractive.

Limitation of Materials

Dielectric heating is applicable only to materials normally considered poor conductors of electricity or insulators. When the electrical resistivity of a material drops below 1,000 ohm-cm., it is usually possible or necessary to use some technique other than dielectric heating. The state and characteristics of the material have considerable influence on the division point, changing it as much as 10 to 1.

A convenient formula for calculating the heating in dielectric materials is given by:

$$W = \frac{1.41\, A\, f\, E^2\, e'' \times 10^{-12}}{d} \qquad (1)$$

where W = rate of heating in watts
A = area of electrode in square inches
d = thickness of material in inches
f = frequency in cycles per second
E = voltage RMS
e'' = loss factor of material = $e' \tan\delta$

The following paragraphs discuss briefly each of these factors.

Dimensions

Dimensions of the piece of dielectric material are important in that they may influence an application as to frequency, rate of production or electrode design.

In general, dielectric heating becomes attractive when the thickness of the material is sufficient to make it difficult to heat the material throughout by conventional means. In terms of inches, this will vary with the thermal conductivity of the material.

Thickness of the material must be reasonably uniform if uniform heating is desired. If the work is of such shape, (for example wedge shaped), that two pieces of material can be placed in complementary positions and the resultant thickness be uniform, the material will heat evenly. Special technique in electrode design and arrangement may sometimes be used when dealing with irregular thickness materials. The relation of thickness and voltage will be discussed under voltage.

Area of material to be heated will limit the frequency which may be used, in two ways.

Capacitive reactance of a large area may become low enough to make tuning of the load extremely difficult if not impossible. The currents involved may also reach magnitudes difficult to handle.

Length of the load may be such as to produce standing waves. This will be discussed further under frequency limitations.

Sometimes it is possible to scan the material thus reducing the electrode area to a value which permits convenient adjustments and frequencies sufficiently high to produce desired rate of heating.

Occassional applications are encountered where a particular area can be heated if the material is

*Electronic Engineer

stacked, increasing the thickness dimension and thereby reducing the capacity of the load.

Frequency Criteria

In general, since the amount of energy introduced into the material is proportional to frequency, the desire is to use as high a frequency as possible. A compromise is usually necessary however, due to one or more limitations.

The effect of large areas and low capacitive reactance was discussed previously.

The length of the material may be such as to produce uneven heating due to standing wave effect. The higher the frequency used, the greater the probability of unequal voltage distribution over a given length or area. If the longest dimension of the electrodes is a small fraction of a wave length, or if the material is scanned, this effect is minimized. Ordinarily if the longest distance from the point of connection to the edge or corner of the high voltage electrode is less than $\frac{1}{16}$ of a wave length, very little trouble will be experienced. Heating will be sufficiently uniform to produce a variation of less than 20 percent over the area involved. In some processes, this may be intolerable, restricting the maximum frequency (or maximum dimensions of the work) to a still lower value.

The *maximum* frequency which can be used without exceeding the above variation in heating can be determined from the formula:

$$f = \frac{62.5}{l\sqrt{e'}} \qquad (2)$$

where f = frequency in megacycles
l = maximum distance from point of connection to edge or corner of high voltage electrode in feet
e' = dielectric constant of material (specific inductive capacity)

Another limitation occasionally encountered is that of generator design for high power at high frequencies. From a practical viewpoint at the moment it appears undesirable to use frequencies above 20 megacycles when powers above about 20 kw are involved.

Decision on Voltage

Power input to the material is proportional to the voltage squared. Hence, if the voltage is increased sufficiently, considerable power can be supplied to the work at relatively low frequencies. There are two factors that limit the voltage which may be applied.

Total voltage between electrodes should be kept under 15,000 volts. It is not impossible to use voltages above this value, but the additional precautions necessary to avoid corona and arc-overs are often more expensive than some other compromise of the engineering factors.

Voltage gradient, that is, the voltage per inch, permissible across the material may be a limiting factor. The radio frequency voltage which will puncture a given dielectric material is generally much lower than the 60-cycle voltage which a material will stand. It appears desirable to keep the voltage gradient below 2,000 volts per inch in porous materials and less than 5,000 volts per inch on less porous.

Another type of voltage limitation may be reached in some applications where it is impossible to have the electrodes in contact with the material. This gives rise to a condition in which the space between the electrodes is occupied by two materials of widely different dielectric constants. The potential distribution in this case may be such as to cause a breakdown of the surrounding medium (usually air).

Loss Factor Considerations

This is a term commonly used to express the degree to which materials will absorb energy by dielectric heating technique. It is easily measured by means of proper equipment. Referring to Equation (1), it is obvious that as the loss factor approaches zero, it becomes increasingly difficult to transfer power into the material. A practical lower limit in the loss factor, of materials which can be heated effectively, appears to be between 0.005 and 0.01. Pure polystyrene, quartz and certain other loss materials have loss factors considerably below this value and are exceedingly difficult to heat by dielectric methods.

The upper limit probably blends into the range where the material becomes sufficiently conductive to respond to inductive fields, although some skin effect will probably be noted before this limit is reached.

Electrodes

One point in connection with electrodes is that heat is not generated in the electrodes to any appreciable degree by the dielectric heating process. The electrodes may be heated by heat transfer from the dielectric material being processed. Often this is undesirable due to the temperature reduction of the adjacent material and may become a limiting factor in some processes. Various simple methods are in common use to minimize this effect.

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Operation Pluto

Hollow cable for use as a flexible pipe-line to carry oil across the English Channel to the invading forces was first conceived in April, 1942, according to the *Electrical Review*. The first ones fabricated were of 2-in. internal diameter and designed to function under an internal pressure of 350 psi. However, the breakdown on test was so high (1,950 psi.) that the operating pressure was immediately raised to 750 psi. Submarine cable practice was followed in the construction, except that insulation requirements could be ignored.

The tin-antimony-lead tube was 0.19 in. thick and covered with two layers of compound-impregnated tape, one layer of bitumen-prepared cotton tape, four layers of 2-in., 2-mil polished, high-tensile steel strip, a serving of 12-lb. gas-tarred jute yarn and the armor. The armor of galvanized steel was protected by two outer layers of jute yarn serving. In laying, the tube was filled with water.

Later cable-pipes were made 3 in. in diameter and reinforced to operate in excess of 1,200 psi. Couplings were designed with light copper diaphragms which are blown out by the pressure of the oil when the repaired cable is put back in service.

Operation began on August 12, 1944. When the war ended, there were 20 pipe lines crossing the Channel. Sixteen were 35 nautical miles long and four via Isle of Wright and Cherbourg were 70 nautical miles long. About half the length was provided by the above design and half by 20-ft. lengths of 3-in. steel pipe welded into 4,000-ft. lengths.

Although not mentioned in the British article, a large portion of the flexible pipe-line was made by American cable manufacturers (see ELECTRICAL WORLD, June 16, 1945, page 12).

Speed, Load Control on Interconnected Systems—V*

Electrical control compensates for droop—Tie-line load control more sensitive; basic equipment outlined—Biased control of superior aid to regulating plant—Use of existing synchronizing motors

E. E. GEORGE, Electrical Engineer, Ebasco Services Inc., New York

LIMITATIONS of the governor mechanism for prime movers on large power systems are now generally overcome by electrical frequency control and electrical load control.

Since this discussion is intended to cover physical principles, and since descriptions of commercial equipment are easily available, no attempt will be made to describe commercial automatic frequency control devices or automatic load control devices. If the operation of the system without automatic devices is clearly understood, their application and use is not too difficult to analyze, especially if the characteristics of the system and of the equipment are known by test.

Basically, automatic frequency control consists of an accurate graphic frequency meter provided with limit contacts for operating the raise and lower circuits to the synchronizing motor. This device holds frequency several times as close as good manual control, and leaves the operator available for more important jobs, especially during system trouble. Such equipment is now used almost universally. It has been improved to a sensitivity of 0.01 cycle.

Calibration of the frequency meter part of the equipment has been a difficult problem until quite recently. Time is the most accurately measured quantity in the world, and the Bureau of Standards radio oscillators are accurate to 1 part in 10 million. The difficulty is in comparing this radio time source with the electric clock characteristic of the frequency meter *during the short period of time in which the power system speed can be held constant*, within 0.01 cycle or less. To meet this difficulty, several power systems have developed stroboscopic methods of comparison. A typical scheme is as follows:

Bureau of Standards Station WWV in Washington broadcasts the standard musical note (middle A) at 440 cycles per second. This is carried on radio frequencies of 2.5, 5, 10 and 15 megacycles to give practically complete coverage of the United States.

This is picked up by a standard radio receiver, the output being used to illuminate a series of neon lamps placed in front of a marked off disc driven by a synchronous motor from the system frequency. When illuminated by the neon lamps the revolving disc appears as a spoked wheel which stands still when the system frequency is exactly 60 cycles. If the system speed is low, the wheel appears to rotate clockwise at a speed proportional to the difference between the system speed and 60 cycles.

This stroboscope, placed adjacent to the recording frequency meter, provides a very convenient and precise check on the latter.

Electrical Frequency Control

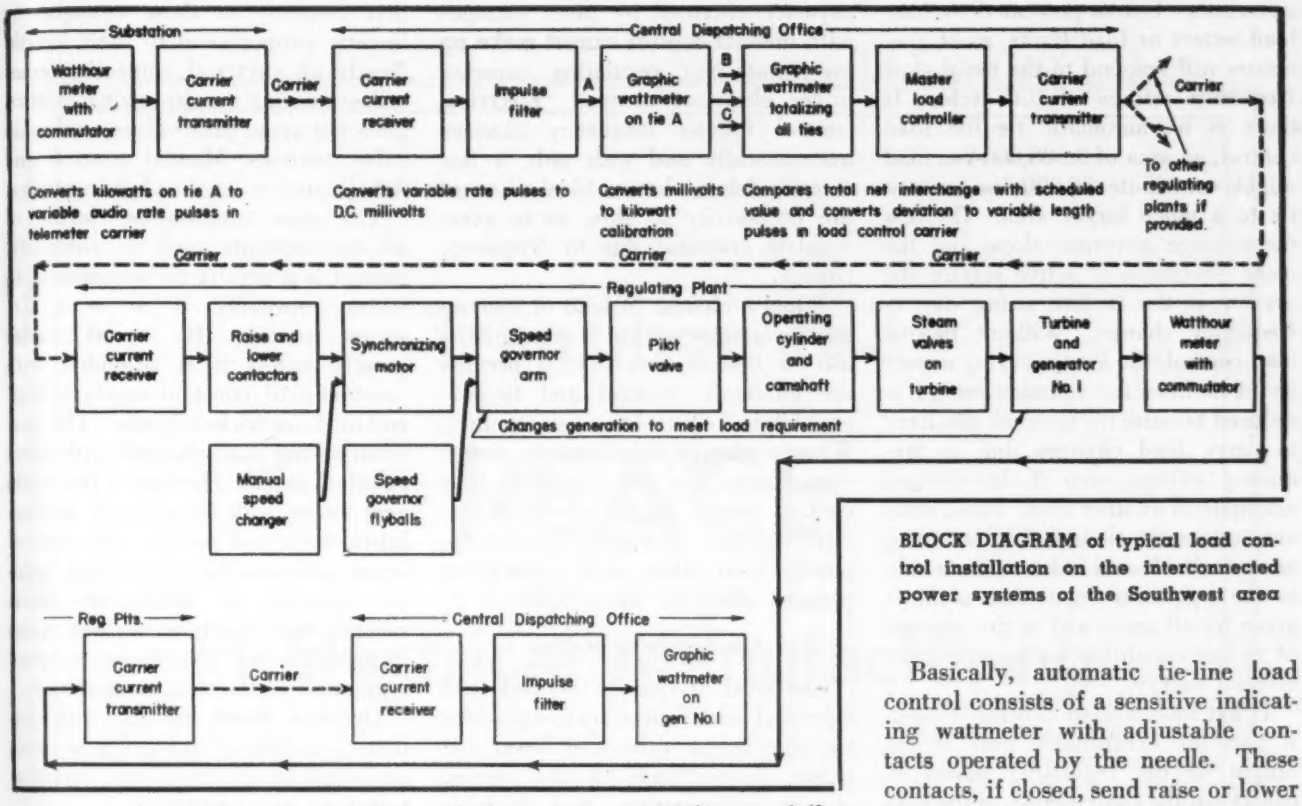
With adequate electrical control of frequency, the governor, as an initiating device, works in parallel with the electrical control. The electrical control is used because of its high and adjustable sensitivity, because it can be made responsive to conditions other than speed, and because it provides the equivalent of zero droop or flat regulation without instability. In the case of frequency control, the governor, within its limitations, assists the electrical control and works in the same direction, except when within the dead band. The electrical control does not change the speed-load droop of the governor, but varies that droop up or down parallel to itself to maintain 60 cycle frequency for all loads, the same as the operator would do. It is not the same as setting a governor with zero speed droop. Actually, the electrical control compensates for the speed-load droop of the governor without removing this droop, which is essential for stable parallel operation of units. Parallel operation of electrical frequency control is usually accomplished by tie-line bias control.

Customary assignment of electrical frequency control to one plant might easily lead to the erroneous conclusion that only that plant should be responsible for frequency and that all other plants should operate on tie-line loading or base loading and be independent of frequency. Such a classification is convenient and in universal use, but it must be given a nominal and not a literal interpretation.

Assignment of Electrical Frequency Controls

It is true that *electrical* frequency control must be assigned to only one plant (or closely coordinated group of plants with special inter-plant controls), while *mechanical* frequency control by governors of good sensitivity, small dead band, short time delay, and coordinated slope can well be shared by every plant with good governors. This sharing of the mechanical frequency control by governors of every plant will materially assist the plant assigned regional fre-

* Preceding articles in this series have discussed the operating characteristics of steam and hydro governors on power systems. This series began in March 17, 1945 issue, page 84.



BLOCK DIAGRAM of typical load control installation on the interconnected power systems of the Southwest area

quency regulation through electrical control, especially on changes of 0.03 cycle or more. Regional control of such assistance is provided by frequency bias, if electrical tie-line control is used. Such bias coordinates help to the regulating plant with the capability of loaded tie-lines.

Large Systems Need

On small isolated systems almost every emergency loss of load or generation and many normal changes in load will tend to cause a change in speed of 0.25 cycle or more, resulting in the operation of governors, regardless of their design and condition.

On large interconnected systems, a major plant, load, or tie-line can be lost and yet it is such a small part of the total system torque and inertia, that the resulting speed change may be too small to affect any governors except those with electrical frequency control. Unless the frequency regulating plant contributes a large amount of capacity, it will take many seconds to correct frequency following emergencies. On normal rapid load changes the regulating plant will frequently be unable to follow the load change, even with manual block changes on other plants made by the dispatcher to keep it in regulating range. The low frequency on the peak and high frequency during the noon hour slump are familiar results of the apparent inability to follow rapid load changes with similar changes in generation without automatic equipment.

Advantages of Load Control

To remedy the above situation, electrical load control or automatic tie-line control has been devised.

Electrical tie-line load control is responsive to load changes of 1,000 to 5,000 kw. (or a few percent of tie-line capacity), whereas load changes of 25,000 kw. on a large interconnected area might not operate any governors without electrical control.

Tie-line load control has the further great advantage that it locates the area where the load unbalance occurs and supplies an adjustable amount of the correction from that area.

It accomplishes this in 5 to 15 sec., not quick enough to have much effect on the initial correcting flow due to inertia, or to interfere much with the initial correction by the frequency regulating plant. Tie-line load control can be interlocked with selective frequency control to withhold tie-line correction unless the correction will help the frequency regulating plant. It can be interlocked with bias frequency control to proportion the tie-line correction to the frequency deviation. Bias frequency control provides an adjustable amount of help to the frequency regulating plant.

Basically, automatic tie-line load control consists of a sensitive indicating wattmeter with adjustable contacts operated by the needle. These contacts, if closed, send raise or lower impulses to the synchronizing motor of a power plant unit on the end of the tie-line away from the frequency controlling end. The contacts can be set just above and just below the desired schedule and thereby restore the scheduled load transfer in case of deviations due to changes in load or generation. In general, the variation can be held within close limits—several times smaller than is possible with the best manual control.

In practice, the wattmeter is generally replaced by several tie-line telemeters to the dispatching office, a totalizer, a differential schedule matching device, a proportional impulse generator, and raise or lower channels to one or more regulating plants. See figure above. To assist in keeping regulating plants within range, telemeters are provided to transmit indications of their generation to the dispatcher.

With automatic, flat tie-line control (no frequency bias), the governors on regulating units work in opposition to the speed changers or synchronizing motors on load changes originating in a foreign area. Both devices work together on load changes originating in a home area.

Correlation with Governor

Use of tie-line load control is intimately concerned with the slope, load limit, and base load setting of

governors. Unless prevented by base load setters or load limits, most governors will respond to the usual slow frequency swings of 0.1 cycle. If there is no automatic tie-line load control, an area of 3,000,000-kw. load might contribute 30,000 kw. over a tie to a much larger area. The less the average governor slope and the more governors in active service the greater is the tie-line swing due to frequency change. Without tie-line load control, the load carrying capacity of tie-lines for valuable energy is reduced because the tie-lines also have to carry load changes due to frequency swings, even if the changes originate in another area. Thus, without automatic tie-line load control, uncontrollable and indeterminate help to the frequency regulating plant is given by all areas and at the expense of tie-line capability for hauling commercial energy.

If flat tie-line load control is used, it uses the controllable part of the output of the regulating plants to cancel out the contribution of the governed base load plants due to frequency changes. This gives the maximum help to tie lines, but no help to the frequency regulating plant. This may be desirable in the special case of a very heavily loaded tie line, but if flat tie-line load control were used on all ties in all areas, the frequency regulating plant could not keep up with the need for frequency regulation, and the frequency would swing much more than 0.1 cycle. This would cause more change in tie-line loading and further limit the economics of interconnected operation.

Bias Control

There is now coming into general use a combination of automatic frequency control and automatic tie-line load control called "tie-line bias control". It is simply an addition of the two schemes in adjustable proportions.

With tie-line bias control, the optimum combination of help to the frequency regulating plant and of increase in tie-line capability can be obtained by setting the bias of each area with due regard for the amount of tie-line regulating capacity compared to base load capacity, slope of governors, required interchange on tie lines, etc., in that area.

It may be noted that regulating capacity obtained by block changes with manual control cannot make up for insufficient regulating capacity under electrical control. Electrical control follows frequency changes automatically and with only a few seconds delay, whereas block changes are necessarily so slow as to overregulate response due to frequency change.

When a change in load or generation originates within a system, the use of tie-line bias control permits the automatic control and tie-governor-flyball control to work together. When a change originates in a foreign system, the use of tie-line bias control results in the electrical devices and the mechanical devices opposing each other, with consequent reduced effect on the tie line.

Synchronizing Motors

Electrical frequency control and electrical load control devices produce variable length raise and lower impulses proportional to the needed change in generation. It is desirable that response to these changes be linearly proportional to their length. Nearly all electrical control schemes utilize existing synchronizing motors, governor arms, pilot valves, and main valve controls. Manual control and flyball control are thus left in service.

The most troublesome device of all the elements used in automatic control is generally the synchronizing motor, especially if it is a d.c. series motor. Its speed varies greatly unless it is provided with constant load, constant supply voltage and uniform friction losses. The governor-spring load changes with valve position, and the reaction of the worm gear varies with direction of motion, lubrication and wear. The use of series resistance to control and equalize response is about the worst scheme that could be devised, since it damages the already poor speed regulation of the d.c. series motor.

Oversize shunt motors, with low inertia, and easily changed gear ratios are available from turbine manufacturers on new orders.

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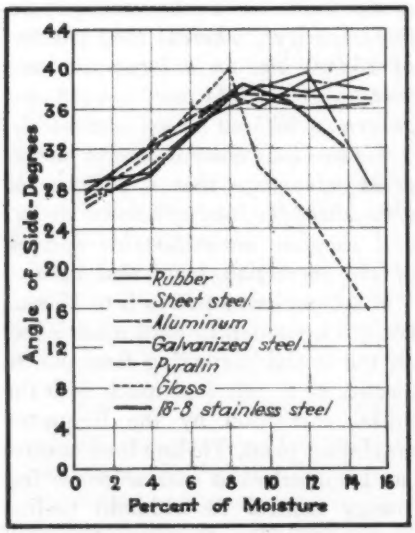
Flow of Coal in Chutes Studied

To insure minimum clogging of coal chutes with wet coal from the stock pile, it is desirable to have the path as short as possible, chutes should be round or oval and tapered or uniformly enlarging and when two streams are brought together with a minimum angle of convergence, angles should be as steep as possible.



EFFECT of moisture content of coal on angle of slide on plane surfaces

These are conclusions drawn from an extensive scale-model study by E. F. Wolf, test engineer, and Harry L. Von Hohenleiten, assistant to the electrical engineer, both of Consolidated Gas Electric Light & Power Co. of Baltimore and reported in a recent New York City meeting of the A.S.M.E. Fuels and Power Divisions.

The model was made of transparent pyralin at one-tenth the scale of chutes that had caused stoppages at Riverside generating station and elsewhere. The fuel is District No. 1 semi-bituminous. Angle of repose was found to increase rapidly with moisture content, reaching 90 deg. at 3.6 percent. Above this moisture it was found possible to undercut the coal. Above 13 percent the wet mass of fully compacted coal had a tendency to bulge out. Thus it is important to use the steepest angles possible, preferable 75 deg. or more, for chutes to handle coal if moistures above 3 percent are to be encountered. With very low moisture contents coal can undergo full compacting without reaching an angle of repose of 90 deg. and, consequently, rat-holing is highly improbable.

Transition to PEACE in Electrical Manufacturing

By JULIUS C. MEIER, Assistant Editor, "ELECTRICAL WORLD"

Transition to production of goods for peacetime uses is now in full swing in the electrical manufacturing field. On every hand questions are heard. When can delivery be obtained on that equipment which is so badly needed? Will models be the same as in pre-war days? Or will fundamental design changes appear? And prices, will they rise or fall or stay at present levels?

Answers to these and other questions that are perplexing the producer and consumer were sought by mail and by telephone from the office of ELECTRICAL WORLD. The concensus of answers contained in this report is necessarily general because the heavy clouds of war have not entirely cleared away and it is yet too soon for plans to have crystallized completely and for post-war conditions to have become entirely clear. However, there has been time for the excitement of the war's end to have died down and for estimate to be made of what is immediately ahead.

In general, it can be said that the customer will be served sooner than was first expected. Some items can be shipped immediately but others will be delayed for reasons plainly apparent.

Manufacturers will make every effort to ship equipment needed for maintenance and repair. Some items will be allocated and individual company construction schedules may be held up as a consequence. Several manufacturers of items falling in this category state that the utilities can help themselves immensely by breaking orders down to the actual number of pieces needed and specifying the dates they are to be used. This rather than a lump order would give all purchasers a better break.

Indications are that prices generally will remain at present levels at least for a time but in many instances pressure to increase them may cause rises fairly soon. The price situation varies with individual items and manufacturers but is quite consistent in tendency—or perhaps desire—to rise. Labor cost increases, as much as 35 percent in some cases, will inevitably have effect on prices. Raw ma-

terials and overhead costs also have increased and they too will affect the final price level.

Many manufacturers have new models and designs either on the drawing board or ready for production. A few of these will contain fundamental changes in design but the greater number are improvements on the old standbys. Almost all of the products rolling off the line in the immediate future will be of pre-war design.

Must Fill the Pipeline

Traffic items in appliance lines will be on the market soon but the heavy power consuming numbers will be much later. There is a long gap between the time the first finished product comes out of the factory and the time the retailer will be receiving regular and adequate shipments. No "dream" models show up but many fundamental changes can be expected in '47 and '48.

Substitute materials will continue in use until the originals are again available or better new ones have proved themselves. Then performance and economics will dictate who will use what and to how great an extent. Several see promise in use of light metals, new alloys and plastics in certain types of equipment but want more knowledge of them.

Many concerns will make sincere efforts to simplify lines but are not too sanguine of success. The customer will still dictate what he wants. The manufacturers are looking hopefully for industry wide standardization of types and sizes as a measure for cost reduction.

All manufacturers are happy with the victory, glad the fighting is over and are now tackling the reconversion job with vigor. They look forward to production of peacetime goods. They want to supply their old customers. They want to protect them in deliveries, to pass on only such portion of increased costs as cannot be absorbed.

There is great enthusiasm as to future business conditions. Growing volume is foreseen for the next two to five years. Government controls are expected to continue for a time but hopes are expressed for relaxations, particularly on pricing policies.

For the convenience of the reader the editorial matter is compiled by products, presenting in each case a general resume of the replies received from the manufacturers listed.

Necessarily a General Picture

This survey is not an attempt to answer all questions. It is simply an attempt to obtain the best and latest information on conditions immediately ahead.

Some readers may know of conditions in regard to certain products which will be at variance with the summaries presented here. It should be kept in mind that statements made herein are necessarily general and could not be expanded to cover all exceptions and particular situations.

Questionnaires take time and effort to fill. A special word of thanks is due to the following manufacturers for their prompt and cheerful responses to the editor's requests for information:

Allis-Chalmers Manufacturing Co.
Aluminum Co. of America
American Transformer Co.
Anaconda Wire and Cable Co.
Babcock & Wilcox Co.
Burndy Engineering Co.
Century Electric Co.
Cumbustion Engineering Co., Inc.
Cutler-Hammer, Inc.
Delta Star Electric Co.
Edison General Electric Appliance Co.
Electric Power Equipment Co.
Electric Service Manufacturing Co.
Fairbanks, Morse & Co.
Foster Wheeler Corp.
G. & W. Electric Specialty Co.
General Cable Co.
General Electric Co.
Holophane Co.
I-T-E Circuit Breaker Co.
Johns-Manville Corp.
James R. Kearney Corp.
Kerite Insulated Wire & Cable Co.
Landers, Frary & Clark
Lapp Insulator Co.
Line Material Co.
Maloney Electric Co.
W. N. Mathews Corp.
Miller Co.
Nash-Kelvinator Corp.
Ohio Brass Co.
Okonite Co.
Proctor Electric Co.
John A. Roebling's Sons Co.
Sangamo Electric Co.
Schweitzer and Conrad, Inc.
Simplex Wire & Cable Co.
Square D Co.
Standard Transformer Co.
Sylvania Electric Products, Inc.
Thomas & Betts Co., Inc.
U. S. Rubber Co.
F. W. Wakefield Brass Co.
Westinghouse Electric Corp.
Worthington Pump & Machinery Corp.

Transformers, Power and Distribution, Regulators

There is a tremendous backlog of orders on 1½-to 5-kva. transformers now on the books and reports state that the orders are still coming in. It will take manufacturers working plants to the limit from 4 up to 15 months to fulfill them. Allocation will be the rule in order to obtain a fair distribution. Some manufacturers expect that their stocks and those of the distributors will be in reasonably good shape in six months, others say nine months, and a couple estimate this will require 15 to 18 months.

Volume shipments are now being made by some manufacturers and others will follow in 30 to 60 days. Most producers foresee no production bottlenecks but others say the supply of porcelain, some grades of steel and malleable castings will be tight for the next 90 to 120 days. All agree that the supply of labor is adequate but some express concern over its competence. One manufacturer is now in full-scale production but the majority state it will require six months to reach that stage.

Many elements have a direct influence on this time factor and vary with individual manufacturers. Those most often mentioned include shortage of engineering and drafting personnel, competence of plant labor, settlement of war contracts, disposal of government-owned materials and facilities, rearrangement of plant, and retooling.

Ordering Started Early

Orders have been coming in to manufacturers since early in the year when W.P.B. relaxed priority requirements. The tide has not increased since V-J day except in one instance and in that case was quite marked. All look for a price increase and one states this should approximate 12½ percent. Labor, overhead and materials are given as reasons for the price rise with the most emphasis being placed on labor's share.

Pre-war models and designs will be continued in production and in some cases will include minor changes. Some manufacturers are planning to continue production of models designed especially for the war period but the greater percentage will use all available plant capacity for their normal peacetime items. A couple are now working on design changes which will incorporate some of the new materials developed during the war period. These for the most part are not ready for production.

The greater percentage of reports indicate that, at this time, it can be expected that a simplification of designs, ratings, etc., will be carried out in the production of products for post-war use.

Orders of voltage regulators will be filled in order of receipt and price is expected to stay essentially at present levels. Plants have a backlog of orders which will utilize plant capacities for a period of from five to six months. Models will be of pre-war designs and efforts will be made to simplify the lines.

Porcelain Insulators

Purchasing of insulators have been heavy through the war years. The orders at the present time are of such volume that most manufacturers have little or no stocks. Shipments are made right off the production line and this condition will exist for a period varying from six months to a year. Most manufacturers report that the supply of competent labor is the big bottleneck. It will take time to train the new laborer, the returning veteran, etc. and most concerns expect that it will take until February or March before full-scale production will be feasible. However, one manufacturer reports that labor supply is now satisfactory. Another sees a three to four months shortage of malleable iron castings.

There is agreement that some allocation may be necessary. Present backlog of orders now on the books will require from six to nine months to fill. Some increase in orders was noted immediately following V-J day. One manufacturer expects prices to remain at present levels; all others expect a rise. Increase of labor costs is given as largest contributing factor to price rise but several mention taxes as making it difficult to set future prices.

All manufacturers are expected to resume production of pre-war models and designs and will not continue those produced especially for the emergency period. No new models differing radically in basic design are expected immediately but some concerns expect to use the newer materials at a later date. Some manufacturers are expecting to use this as an opportune time to simplify their lines.

Overhead and Underground Equipment and Hardware, Fuses, Fittings

V-J day started a heavy influx of orders to most manufacturers and in some cases increased the amount and number beyond expectations. Others state that increased buying has not yet started but will get under way shortly. All will be making volume shipments before the first of the year, in fact one manufacturer is now doing so. Present indications are that partial shipments will be made to assist customers with badly needed items. This will be particularly true of fused cutouts and some items of hardware. Certain manufacturers believe a delay of several months will be necessary before utilities will start large scale construction programs. The

reasoning behind this is that time will be needed to recruit and train field crews. This interim of time will be used to build distributors' stocks.

Immediate shortages of copper, porcelain, certain plastics and malleable iron will affect the date that full scale production will be realized. This may be three months on a few items and may be six months if materials supplies are slow.

It will take from one to six months to work off the present backlog of orders. Inventories will be built up after orders are filled and as plant capacity becomes available. Most concerns state that prices will remain at approximately present levels on most items but others say a rise is necessary and may amount to 20 percent above the present price. Tax conditions are not causing too much concern except in one instance. Except for two manufacturers, all state that should a price rise come it will be the result of increased labor costs. These two feel that increased costs of raw materials will be the major cause and discount any additional labor cost.

Production of pre-war models and designs will be resumed and in some instances models designed for the war period will also be produced. These, however, will incorporate slight modifications. There are new models and designs now in the development stage and production will begin as developments are completed. Some will appear early in 1946 and others will not be ready until late in 1947. Some of these designs will utilize the lighter metals and plastics.

Nearly all manufacturers expect to simplify their lines. Several state they will be guided by the report of the EEI-NEMA joint committee now working on simplification and standardization of mounting hardware. In the underground field, indications are that certain sizes of ducts will be eliminated to simplify utility stock problems.

Oil and Air Circuit Breakers, Switchgear

No serious conversion problems are reported by circuit breaker and switchgear manufacturers and consequently shipments of finished equipment are now being made or can be promised for an early date. No bottlenecks are reported except one case of casting shortages and this is expected to be of short duration. Labor supply is adequate and competent and full scale production is either now in progress or will be in a matter of days. One manufacturer expects his production to reach that level in about three months. Settlement of war contracts and some labor changes are the reasons given for his temporary difficulties.

V-J day had little effect on the volume of orders received by all manufacturers with one exception. In that case orders have been heavy and many in number. Orders will be filled in full and in order of receipt. The backlog on the books will keep plants operating from four to nine months and varies between these limits for all manufacturers.

About one-third state that the prices will stay fixed at present levels while two-thirds expect a slight rise. Should this occur all agree that increased labor costs would be the major reason for the rise. Uncertainty as to taxes is a real difficulty in setting future price levels according to 50 percent of the reports while the remaining 50 feel this factor can be ignored.

Production of pre-war models will be resumed and in some cases models designed especially for the war period will be continued as catalog items. Very few new models differing radically in design are contemplated. These new models are still in the development stage and are not ready for production. Light metals and plastics do not figure in the immediate designs but may appear in future designs. All manufacturers expect to use this as a "tailoring" period and simplify their lines.

Wire, Cable, Conductor Materials

Cable manufacturers' reconversion, for the most part, is orders from the consumers' market rather than from the services. Consequently volume shipments can be made on nearly all items immediately. Some manufacturing materials (tin, rubber, lead and cotton) are short but nearly all see this as a condition of short duration. Full scale production is now in full swing in some plants and others expect to reach that stage within 30 days. Rescheduling and disposal of surplus materials and settlements of war contracts may have a slight effect on this time schedule but most concerns feel it will be slight. They expect early governmental action.

In a few instances V-J day brought additional action in the order department but it was not heavy. Orders will be filled in order of receipt with this exception, all manufacturers will endeavor to make partial shipments if necessary to help out in emergencies or to fit into the construction schedule of the customer. There is a backlog of orders varying in amount with the type and size of wire. It will take from two to six months of continued, full plant operation to fill these orders. The manufacturers will attempt to build distributors' stocks as fast as possible. Some have already started and the others will shortly. However, orders will be filled first and stocks replenished as plant capacity is available.

The consensus is that prices should rise but this is dependent upon O.P.A. action. Some feel that the rise will be temporary and that competition and changes in raw material costs will allow the price to

settle back to its present level. The influence of increased labor costs on the selling price brings two diverging opinions. One group sees it as the largest contributing factor and the other states that labor costs are only about 20 percent of the finished item price and that any foreseeable labor cost increase would have minor effect on the selling price.

Production of pre-war types and designs will be resumed as soon as the necessary raw materials are available. A sure and steady flow of natural rubber is one of the foremost thoughts in most manufacturers' minds. Only those products developed during the war period which have equal or better operating characteristics will be continued in production. Some concerns expect to use plastics quite extensively post-war. Others state that coaxial cable will be continued as a standard catalog item.

Some new designs in tree wire and self-supporting cable are about finished and will be in production soon. Some manufacturers will attempt to simplify lines but the majority feel this is an impossibility. They state that customers requirements will determine what is manufactured and every attempt will be made to satisfy them.

Meters, Instruments, Regulating Devices

All reports state that meters, instruments and regulating devices will rise in price. Some state that this increase will approximate 10 percent of present level and reflects the average 35 percent boost in overall labor costs. The opinion on the subject of tax uncertainties and its affect on price levels is evenly divided. One-half state it has no affect while the other replies state that they must be lived with and consequently the manufacturer must play safe.

Volume shipments are now being made in some instances and others expect to begin shortly after January 1st. Glass and gray iron casting are the only bottlenecks now apparent. Supply of labor is reported as adequate and competent. Full scale production is expected in from two to three months. Adequacy and regularity of supply of raw materials and processed parts may influence this time somewhat according to one report.

Orders started arriving in volume previous to V-J day and have accelerated since that date. One manufacturer states they now approach 1941 volume. Allocation is expected for the next six months to one year period. Back orders are quite heavy and several months will be required to fill these. Replenishing manufacturers' and distributors' stocks will take anywhere from nine months to three years and is completely dependent upon volume purchases during that period. One report states a demand of 15 to 20 percent above normal is expected for the next five years.

Pre-war models and designs of watthour meters and indicating instruments will be produced and in some cases will include slight changes. No new designs are foreseen in the immediate future. Several changes are being made in instrument transformers to meet the surge test requirements instituted shortly before the war. About 50 percent of the manufacturers expect to simplify their line of products while the remaining 50 state the number of types will remain the same as pre-war.

Power Specialties, Bus Hardware, Switches

Business from the "old customers" has been increasing steadily since the first of the year, while contracts for direct war materials have been tapering off since that time. Consequently, there has been a gradual shifting of labor from war work to peace time items in most of the plants. One typical manufacturer's report states that all that remains to be done to complete this changeover is to dispose of partially completed and finished war goods, relocate some machinery, dispose of some of the machinery not useful for regular peacetime lines, and he is ready to go 100 percent. The time necessary to complete the changeover is expected to be about six weeks.

Volume shipments can be expected within a few weeks. However, several manufacturers state that the shortage of malleable iron and the uncertain labor situation in some porcelain plants may cause difficulties for a period of six months. One manufacturer looks for difficulty because of shortages of castings and motors. Some difference of opinion exists on the labor situation; one states satisfactory now, others state the condition is gradually easing and a third group feel that the supply of competent labor will not be adequate before January 1, 1946. Labor changes, disposal of present raw materials inventories, disposal of partially finished products, and settlements of war contracts are seen as factors having the most influence on the time required to get into full-scale peace-time production; other factors mentioned are retooling and re-arrangement of plant facilities. All expect to be converted 100 percent within six weeks. Manufacturers and distributors stocks are expected to be at pre-war normals in about 90 days.

V-J day started a few new orders coming in but not in large volume. These and subsequent orders will be filled in order of receipt. Backlog will be cleared up with existing plant capacity in from two to three months. Prices are expected to rise, dependent upon

OPA action. Labor is the factor most often referred to as the major cause for the increase but a couple of manufacturers feel that the returning veteran may lower the labor rates. Uncertainty as to taxes is apparently no difficulty in setting future price levels although one manufacturer states, "We shut our eyes and hope."

Pre-war models and designs will again be produced but the models especially designed for the war period will not. There are new designs in the offing and in some instances these are ready for production. Some of these will include lighter metal alloys and plastics in the design. Most manufacturers feel that this is an ideal time to simplify the lines and are so planning.

Motors

This product classification may seem to some readers as capable of better discussion in two parts, one dealing with fractional and the other with integral sizes of motors. However, the factors of materials and labor, which are the immediately important problems, apply about the same to both groups and justify their inclusion under the one heading.

Production and shipments are continuing pretty much at war-established levels, but could be considerably increased if materials and labor were freely available. Castings, sheet steel and cotton tape are cited as the more important materials shortages. Adequate and competent labor is a present bottleneck on the immediate breaking of which not too much optimism is apparent. Estimates of time needed to reach full production on the scale required by the foreseen market range from six months to more than a year. In addition to labor and materials, retarding factors mentioned are need for additional plants and facilities and conversion of existing facilities. Manufacturers' and distributors' stocks will not be up to normal for a year, possibly two years, depending on the demands of industrial users.

One reply reported many new orders following V-J day; others said comparatively few. All replies cited large backlogs of orders, equal to productions ranging from six months to more than a year. For some time to come allocation of quantities to orders will be necessary, with some natural preference given to old customers. Pressure against maintenance of present price levels is evidently very strong with costs of labor and materials the principal causes. No worry about taxes as a cost is apparent.

Basically, motor production was unchanged by the war and it so continues. Evidently it will be some time before the new developments in insulation, silicones for example, have any wide effect on motor designs. All replies said that new models, differing radically from present designs, are forthcoming but are not now generally ready for production. Again, as has been reported for other products, simplification of motor lines by reductions in numbers of sizes and types will be striven for as peacetime production is resumed.

Industrial Control Equipment

Shipments are being made now in fairly large volume which will increase in five to six months as production rates rise. Production is now being held back by shortages of sheet steel, castings and molded parts but it is expected that these conditions will improve soon. Shortage of labor, except in regard to highly skilled as tool and die makers, mentioned in one report, is not seen to be a bottleneck. Settlement of war contracts, retraining labor, re-arrangements of plant facilities, disposal of war production remainders and retooling are cited as reasons for delay in raising production volume. Time for building up manufacturers' and distributors' stocks is estimated at from two to six months.

One reply reported a large increase in orders following V-J day; others said only some increase or none. Allocation of quantities may be necessary on large orders and for certain items but generally deliveries will be made according to dates of receipt of orders. Order backlogs, stated in money totalling $12.5 million for three of the replies, run as high as six months production in some lines.

It is vitally necessary to raise prices above present levels according to one reply, opinion in a couple of others is that they will rise, but all seem to accept that they will remain as at present for a time.

War requirements necessitated little or no changes in product designs and old models will be continued generally. But, it is expected that improvements will be incorporated as fast as they can be placed into production, only one reply promises new models differing radically in basic design and these not yet ready for production. Use of light metals and synthetics appears to be definitely a matter for the future. All reporting makers seem to view simplification of product lines as a desirable effort towards cost reduction and several intend to use the resumption of peacetime production as a favorable occasion for this.

Industrial Equipment, Wiring Devices, Panelboards

Shipments of these products can be made in fair volume now with large increases probable in from two to three months. Shortages of materials hindering present production are in porcelain and metals and in molded parts of all kinds. Delivery is not good now on many other components but is improv-

ing. Except possibly skilled mechanics, adequate labor is available. Another factor mentioned as hampering attainment of production volume is time and attention required to get clear following cancellation of war contracts. Estimates of time necessary for building up of manufacturers and distributors stocks vary from two to six months.

There was no sudden influx of orders following V-J day. Stock orders had started earlier as release of restrictions on procurement of materials had been announced. Orders resulting from reconversion of industrial facilities are not yet coming in volume. For at least two or three months, possibly longer, there will have to be some allocation of deliveries to orders. Backlogs of orders reported by individual manufacturers range from two to four million dollars and it will take about three months to clear these.

Prices are evidently going to stay pretty much at present levels, although efforts to convince OPA of their necessity may bring some increases later. Labor costs figure most largely in this picture. The tax situation apparently will not be a large factor in setting price levels.

In this field of industrial equipment there was very little change in products to meet war-time requirements. Therefore production will continue largely as is and with no important changes in basic design, although some such changes later appear likely. There will be no immediate large use of newer alloys. Simplification of lines of products does not seem to be an instant concern but future design will take it seriously, especially as a cost determinant.

Appliances

Manufacturers report that it will take about two months from the date that the first major appliance rolls off the assembly line before Mr. Retailer will be able to display samples. And another two months before retail stocks will permit extensive promotion. All manufacturers will be making volume shipments before June of 1946, on all minor appliance and most of the majors. Refrigerators seem to be the exception, some concerns expect it will take a year. Some manufacturers are now shipping irons, clocks and portable heaters but it will be well into the first quarter of 1946 before all of them will be making volume shipments.

Plastics, fabrics, paints, phenolic resins, chromic acid, rubber and special steels are some of the shortages which will hinder immediate production. However, relief from most of these is expected before January 1946. For the most part the labor supply will be adequate but in certain localities a training program is being instituted to make that supply competent.

Full scale production on traffic items is expected in some plants within 60 days, in others up to six months will be necessary. Ranges, refrigerators, home freezers, and washers vary with each manufacturer and each appliance. Washers are expected to appear first, followed by ranges, refrigerators and home freezers. These can be expected anywhere between three and 12 months.

Retraining labor, securing even flow of raw materials, setting up production lines and rearranging plant facilities are the factors most often expressed as influencing the time required to reach full scale production. However, from ten to 18 months are needed to build up retailers' stocks on major appliances and six to 12 months on the traffic items.

V-J day started a flood of inquiries in most instances and a few orders. But most manufacturers are not accepting quantity orders; they are allocating the available merchandise in order to obtain a fair and equitable distribution. All manufacturers have refused to accept prior orders.

The greater number of replies indicate an immediate price rise if allowed. There are indications that this would be temporary; volume production and competition easing the price to about its present level within a two-year period.

All feel that increased labor costs will be reflected in the selling price of the appliance; some go so far as to say it will be the increased cost of the finished product. The viewpoints on taxes differ; some state a definite long range tax program would settle one factor in setting the retail price while others claim that it has no effect.

Production of pre-war models will be resumed and in some instances will include "face-lifting" changes. Models differing radically in design are contemplated by most manufacturers but not until 1947.

Light metals, plastics and composite wood will be included in future designs to a limited extent. In each case they must compete with the old standby on the basis of function, suitability and cost. Most manufacturers feel that this is an opportune time to simplify lines and reduce the number of models.

Lamps, Lighting Equipment

Except that it opened wide the gate for entrance to the market, the end of the war changed the lamp business picture very little. Important advances in design had already been announced, production was settled down, stocks were not greatly depleted, orders had found a level, and prices were established. Apparently the lamp industry just looks forward to more of the same and is ready for it.

As to lighting equipment, the situation is different. Many manufacturers turned all or major parts of their plants over to war production and are faced with problems of reconversion, such as rearrange-

ment of plant facilities and disposal of partially finished war products. Volume shipments may be held up for two or three months because of these delays in getting into production. Some months more, possibly six or eight, will be needed to build up manufacturers' and distributors' stocks.

Some increase in orders was noted following V-J day, adding to an already large backlog which may take three or four months to work off and will require allocation to handle fairly. Prices will remain at present levels but with labor costs pressing to push them up.

Pre-war models will be first production, probably soon to be replaced by new designs incorporating light metals and plastics more largely than before. Cost will be a strong incentive towards simplification of product lines.

Turbo-Generators

Built-to-order in most cases, turbo-generators are shipped as fast as production allows, and that is the present condition. Production is not as fast now as it will be in a few months. There are no material shortages to hold back production and labor is adequate and competent; the only retarding factor is lack of sufficient engineering and drafting personnel.

Order volume started to build up with the removal of priority restrictions in the first half of the year and V-J day brought no significant increase. Production is scheduled as orders are received. The backlog of orders is large, sufficient to carry production well into 1947. It seems to be the general feeling that prices will remain temporarily at present levels, but that they should be higher, mainly because of increased labor costs.

Refinements and improvements are continuous in turbo-generator design, therefore nothing radically new can be looked for in peace-time production although certain developments resulting from experience in building large numbers of turbines for ship propulsion during the war will be incorporated. Use of light metals and synthetics in any large degree is not foreseen immediately, although perhaps in the future they will become important. Before the war efforts had been started towards standardization of types and sizes as a measure of cost reduction. These efforts will continue, their benefits having been convincingly demonstrated in war production.

Boilers

The boiler industry in general has not been forced into new lines of manufacture during the war period, but has expanded facilities to take care of increased production of pre-war products. Makers see no apparent shortage of materials used in manufacturing the steam generating units. The supply of competent plant labor is expected to be adequate but the shortage of engineers and draftsmen continues. Some report that this condition has eased somewhat since V-J day. Increased activity became apparent about July 1st and V-J day neither accelerated or decelerated the trend.

Most concerns have orders for post-war delivery and sufficient backlogs to keep the plants busy for six months. All except heavy orders for the next two years, some of these up to 25 percent above pre-war levels. The manufacturers all expect price rises. Labor costs have increased approximately 35 percent in certain plants.

Production of pre-war models will be resumed with improvements in design which have occurred during the war period. Experience gained with alloys during the past few years point to designs utilizing higher temperatures and pressures in the immediate future. Production-line methods developed and used in manufacturing war-time models may be continued as a standard practice in some instances.

Pumps, Compressors, Condensers

Production in this group remained generally unchanged by war requirements; the condition now is simply that the output is going to different buyers. Thus there are no special problems associated with peace-time production except as result from shortages, cited in one case as of sheet steel and iron castings. Foundry labor difficulties may prolong the delay caused by casting shortages. Settlement of terminated war contracts may be some hindrance to production at first, perhaps for six to eight weeks. From two to six months will be needed to build up distributors' stocks.

There was some increase in volume of orders following V-J day but the backlog had been building up continuously for several months before. The backlog is estimated by one manufacturer to represent seven or eight months of production. Allocation of quantities will not be generally necessary, orders being filled according to times of receipt.

It is expected that prices will remain at present levels although cost of labor causes some doubt on this point. Uncertainty as to taxes is somewhat of a disturbing factor in setting prices.

Use of light metals, plastics and other new materials is generally regarded as something for the future, although in the cases of many items they have been incorporated as they became available and proved their value. Simplification of product lines is stated in one reply as a matter of long-established and continuing concern to which peace-time operation will probably give opportunity for closer study.

Portable Bridge for High-R Cable Faults

High-voltage d.c. slide-wire, well insulated, bridge locates stubborn faults in underground cables which refuse to burn to solid ground—Kenetron, transformer and voltage regulator supply power for test

T. G. HIERONYMUS, Kansas City Power & Light Co., Kansas City, Mo.*

FOR SITUATIONS where faults on underground cables cannot be burned to a solid ground, but persist as high-resistance faults, Kansas City Power & Light Co. has equipped both its Grand Avenue and North East generating stations with a high-voltage, d.c. slide-wire bridge based on a scheme originated by the British.

The apparatus used at Kansas City consists of two principal parts; a source of high potential direct current and a portable slide-wire bridge insulated for 50,000 volts to ground.

High-voltage direct current for operation of the bridge is supplied by a Kenetron rectifier tube having an output rating of ¼ amp. at 75,000 volts, connected in series with the primary winding of a 30,000-volt test transformer; the primary of which is supplied at 1,100 volts a.c. through a voltage regulator. Filament supply for the Kenetron tube is from a discarded 33,000-volt, metering current transformer energized from the low-voltage side at 115 volts through a series resistor.

The instrument portion of the bridge, consisting of a milliammeter, slide wire and galvanometer is insulated for 50,000 volts to ground, is enclosed in a grounded wire cage and mounted on a two wheel cart, as pictured. Both the operating handle of the slide wire and the galvanometer push button, properly insulated, extend through the safety screen.

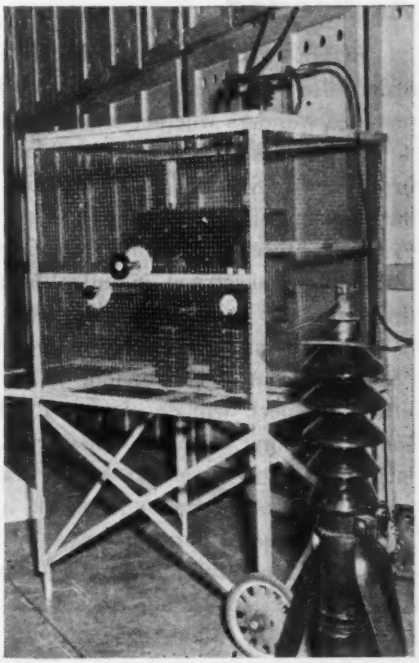
The slide wire, used with the bridge, consists of ten turns of resistance wire wound on a drum with the slider shaft carrying a dial with 100 graduations. Ten revolutions of the dial carries the slider over the entire length of the slide wire, thus providing 1,000 graduations.

Connections from the Kenetron rectifier, located at one side of the switch house, to the bridge in the cable terminal gallery, are through permanent test cables that terminate in a single pothead at each floor in the plant.

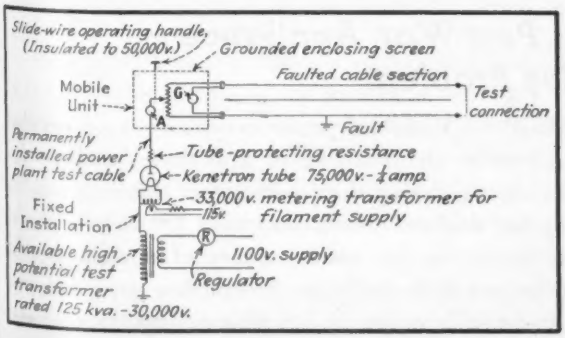
As the diagram reveals, the output of the Kenetron is connected to the slider of the slide wire, through a milliammeter.

To use the bridge, a loop formed by joining the de-energized faulted cable conductor with one of the two sound conductors at the outer end of the cable section, is connected to the bridge terminals as shown. Then, with the voltage regulator adjusted to give 12-15 m.a. through the fault the bridge is balanced until no deflection is obtained on the galvanometer. Reading the dial of the slide wire then gives the location of the fault in *percent of the total length of the conductor loop* connected to the bridge (twice the length of the faulted cable section). For example, if the dial read 250 the fault would be midway along the faulted *conductor* or 25 percent of the distance around the loop measured from the near end of the faulted conductor.

This type of high resistance bridge has been used for approximately five years on the Kansas Gas & Electric Co. system and has proven extremely valuable in locating high resistance cable faults that defied location by conventional low-resistance bridges. Faults have been located within a cable section in a 10-mile circuit.



SLIDE WIRE BRIDGE, mounted on cart and insulated for 50,000 volts to ground is enclosed in grounded wire enclosure. In foreground is test cable pothead connecting bridge with high-voltage d.c. equipment in plant basement



CIRCUIT OF HIGH-VOLTAGE slide wire bridge used to locate high-resistance cable faults

* Superintendent, Underground Lines.

Editorials

S. B. WILLIAMS, *Editor*

Orders Should Be Placed As Needed

IN SOME LINES OF ELECTRICAL EQUIPMENT orders are rolling in so fast and deliveries are so long that one wonders whether a repetition of 1919 and 1920 is in the making. To all outward appearances these orders seem firm, but so they did after the last war, until the bubble of pyramided orders burst.

Manufacturers, as is indicated in the study of conditions among electrical manufacturers which appears in this issue, are going to do their best to satisfy the needs of their customers. If orders are kept down, during this period of plant reconversion, to immediate needs very little bottleneck will develop and deliveries will be reasonably prompt. On the other hand, if customers place large project or inventory orders they may cause delay of delivery of needed equipment to others and bring about a degree of pyramiding.

Some manufacturers are now so loaded that it will be well into next spring before they can fill the orders now on the books. While it is nice to see civilian orders come in once more, it is not a healthy condition at this time to have greatly delayed deliveries. Not only can such a situation breed future unbalance in the market, but it can hold back projects all ready to go ahead and provide employment.

That President Truman was mindful of this situation was evident in his recent message to Congress when he suggested the extension of inventory control. While his remarks referred mainly to critically short raw materials in order to prevent rampant speculation, immoderation of purchasing of finished products is mainly responsible. This and other controls are bound to be imposed if any excesses develop.

After the last war there might have been some advantage in the matter of price protection to place orders well in advance of need, but that hardly holds true this time. Manufacturers are working under ceilings and apparently will continue to do so for some time. However, when orders carry long delivery quotations, it is more likely that prices quoted will be those in effect at time of delivery, and that is the only fair thing to do.

The manufacturers are just as anxious to get goods to customers as they are to have them. Customers can help them to develop an orderly market by ordering as needed or with specified delivery dates.

Visual Inspection of Generators

ELECTRICAL TESTS to determine the condition of winding insulation in generators are none too conclusive largely because it is not yet possible to correlate the indications of the various tests that can be applied. Until data on insulation resistance, dielectric absorption, power factor, dielectric loss and ionization can be put into a hopper that grinds out a single answer it will not be possible to be very specific in predictions. The operator or manager that longs for the day when it can be said confidently that a certain machine will almost assuredly fail on a certain Spring day in 1948 will have to wait a while longer. Progress is being made and the answer will be hailed when it is announced.

Meanwhile there is no excuse for neglecting the obvious things that can happen to incapacitate an important generator, such as being meticulously thorough in searching the innards for extraneous objects, loose end turns, visible injury to insulation, etc. It is surprising what gets left inside machines when they are closed up after inspection. One manufacturer cited bolts and nuts, pieces of conduit or angle iron, chain links, lock washers, metal chips and shims, box cover plates, and all kinds of tools. When these gravitate into the air gap it is no more a joke than when the surgeon absent-mindedly leaves his scissors inside when he sews up the incision. Similar check should be made for loose coils and wedges, slack ties and brace blocks, coil connections, fan blades, collector rings, etc. If the winding has been cleaned, examination should be made to determine that it was not injured by too much "elbow grease."

When the load eases off enough to release some alternators for inspection and overhaul it will be well to reexamine the existing instructions to make sure they cover all these points. Failures due to lack of care can be just as effective in making the station capacity situation a tight one as has been the restricted ability to get machines during the war.

The Post-War Appliance Sales Problem

A LARGE NUMBER of power companies have decided not to re-enter the retailing of appliances, at least for the time being, taking the position that this is a job for the regular dealers. Many also have felt that it would be far better for the small number of appliances that would be available until the distribution pipe line was filled to be sold by the dealers who needed the business.

Certainly, at the beginning, this seems to be a generous and fair position to take, but it would not be wise

to make this a permanent policy, at least until the dealers had demonstrated their ability to dispose of considerably larger volume of appliances than ever before.

By next June, according to a WPB release, all electrical appliances will be in greater production than the average month in the three years before we got into the war, anywhere up to double or more. The years 1939, 1940 and 1941 were the largest the appliance industry had and now to double that means a strain on the sales force of the whole industry.

Before the war in many lines the dealer sales accounted for 85 percent of the total and on that basis it wouldn't appear as though the utility sales were enough to make any impression on the market. On the other hand, the evidence points to a large percentage of sales of other than traffic appliances originating with the power companies and directed to the dealer. The influence, therefore, of the utility in appliance sales creation has always been large in spite of the cash register figures.

With the production estimates before us for next year, it looks as though utility participation in merchandising will have to be bigger than ever if sales are directed to the dealer. On electric ranges, for instance, the output is estimated by next June to be at a rate that will be well in excess of a million units a year. That's a lot of ranges.

In other words, let no one think that because a number of utilities are not reopening their store merchandising they are not in the picture up to their ears. The dealers will need their help now more than ever before.

Control Cable Maintenance

PRIME DEPENDENCE is placed on station control cables and for that reason they have to be installed properly and maintained adequately. The installation design and execution can ward off later troubles if incorporated are measures learned from the lessons of those who have had grief. Water in ducts, condensation in terminal boxes, freezing, poor taping, damage by adjacent heat, poor joints, stray currents in lead sheaths—those are just a few of the things that have gone amiss at one place or another.

The remedies are drainage, moisture-sealing, better workmanship, improved detection and protection measures, ventilation, complete or partial relocation and the perennial issue of inspection and maintenance.

Maintenance in the instance of control cable is essentially a matter of testing for insulation condition. Practices not only vary but vary widely. Period of testing seems to spread from weekly tests to triennial tests. That is a ratio of 150 to 1 and is probably justified by the difference in vintage of the respective installations. Application of high resistance voltmeter (with lamp grounds removed) gives a criterion that is readily capable of weekly use; if any value runs much over 20 volts the circuits can be successively sectionalized until the deteriorated portion is isolated and its real insulation resistance determined. Whether a megohm or a quarter as much is considered acceptable is a matter of judgment and experience.

Some of the lessons learned where such programs have been in force are that non-metallic-sheath cable buried in the ground is an alternative to lead-sheath cable in metallic conduits and that accessible and good grounding facilities are desirable. Conduits can often be more generous and additional pull-boxes are frequently an advantage. Above all it is essential that drainage be provided and consideration given to sealing and to ventilation.

Not So Good Yet

IF THERE BE ANY that are prideful and complacent, assuming good accomplishment in the job of making the American people to know and understand what electric service means in the home, then they should learn humility by studying the "Urban Housing Survey" of the Curtis Publishing Co. In the collecting of information on plans for home ownership in this survey prospective owners were questioned and they expressed preferences on type and size of house and style of architecture, on outside and inside wall materials, on inside decoration, on roofing materials, on insulation, on fire- and sound-proofing, on space and water heating equipment and on financing. On electric wiring evidently no questions were asked for no replies are reported. Nor are there any mentions of home lighting or convenience outlets. In fact, the only specific references to electric service in these prospective new homes are to water heating, for which 22.7 percent of the intending owners say they prefer electricity, and to house heating for which 3.9 percent want—Save the mark!—electric furnaces.

A better, but not much better, picture appears in plans for home improvement and repair. Electrical work is planned by 8.3 percent of those reporting and $36 is the median intended expenditure. This is the lowest expenditure in the list of 14 items of which the highest is $487 for additional rooms, with $338 for a garage coming next.

Although the survey apparently indicates that people are only faintly conscious of the necessity for provision of facilities for electric service in their new and rehabilitated homes, it shows quite definitely that people do want those services. This is brought out in that part of the survey that reports plans for the purchase of household appliances, equipment and furnishings. Refrigerators lead the list with 25.5 percent of those interviewed intending to buy at a median price of $196. Next comes the vacuum cleaner with 21.7 percent intending to buy at a median of $80. Third is the cooking range with 21.5 percent and $155 median. The electric range promoters can take comfort from that proportion of 21.5 percent, of which nearly one half is people who plan to buy electric ranges.

WASHINGTON COMMENT

By R. N. LARKIN, Washington Correspondent

Truman Program on Valley Development

SCHOOL is just about out for those advocates of public or private ownership of electric power who had uneasily or hopefully been counting straws to determine whether President Truman's administration would pursue a vigorous pro-public ownership power policy.

In that section of his recent message to Congress entitled "Public Works and National Resources," Mr. Truman declared—not unexpectedly—for lots of public power. He also gave a broad hint of the direction which federal power development may take, and—more surprisingly—a suspicion that he may outdistance that "all-time all-timer" of public power, the late President Roosevelt. It is possible that Mr. Truman may accomplish the extension of valley authorities even farther than Mr. Roosevelt could have done had he lived.

"I hope that Congress will proceed as rapidly as possible to authorize regional development of the natural resources of our great river valleys," Mr. Truman declared, ". . . we must harness our streams for the general welfare; we must rebuild and reclaim our land. . . . This is not only to provide men and women with work, it is to assure to the nation the very basis of its life. . . ."

Method Not Chosen

Neither new nor surprising, this reiterates and reaffirms a policy which did not begin with him, but which will be carried on by him. It is most interesting in its failure to choose between the two methods of regional development which Congress has argued at as great length during the last 18 months as perhaps any other domestic issue. Unlike his predecessor, Mr. Truman endorsed neither the valley authority concept of regional development nor the concept which would do the job by and in the tradition of the Bureau of Reclamation and the Corps of Engineers. The message made it plain that much work remains to be done on major U. S. watersheds and left it to the proponents of each concept to inflict and sustain the bruises which will come before the issue is resolved. The existing Congress and its successors conceivably might react to the absence of dictation on a decision almost wholly their own by extending the valley authority concept farther than Mr. Roosevelt ever could have driven them.

Valley Authority Preferred

His failure to stipulate which concept should prevail did not prevent Mr. Truman from including in his message some suggestions as to the direction he would prefer. The message indicates that the President would prefer the valley authority. It indicates also that his conception of a desirable valley authority is somewhat broader than that exemplified by the Tennessee Valley Authority. This conforms to the ideas on a Missouri Valley Authority which Mr. Truman disclosed to the *St. Louis Post-Dispatch* shortly before his accession to the Presidency (ELECTRICAL WORLD, April 28, 1945, page 88).

"We must proceed with all possible diligence not merely to restore these depleted resources to their pre-war standards but to make them greater and richer than ever before," the President's message declared. "We must make a diligent effort to discover new deposits of the precious and indispensable minerals upon which our national life is founded. We must develop for the use of industry new technologies so that the vast deposits of low-grade ores . . . may be put to work. . . . We have before us the example of the TVA, which has inspired regional resource development throughout the entire world. We . . . have . . . programs . . . for regional development of the Columbia River . . . the Missouri River, the Central Valley of California and the Arkansas River. It should be unnecessary to say that the conservation and development of the national plant must proceed according to an intelligent and coordinated design. The watersheds of this nation are not utterly independent, one of the other; our irreplaceable wealth of minerals, land and timber is not composed of segments which can effectively be dealt with separately. Any program of public works must have as its unifying purpose the greatest possible contribution to the wealth of the nation and to the wealth-producing capability of the nation."

These suggestions do not rule out irrevocably the participation and the traditions of the Bureau of Reclamation or the Corps of Engineers in Mr. Truman's ideas of regional development. They do, however, fit the activities of TVA much more closely than those of Reclamation or the Engineers, so much so as to indicate the President's preference rather plainly.

On the other hand, indicating his divergence from the letter of the TVA concept is another paragraph of the Truman message to Congress, which asserts:

"It is necessary that we proceed as speedily as possible to set up machinery to make an inventory of our national wealth and our basic resources, and to test the suitability of plans and proposals for public works in the light of this purpose. An agency of this sort could provide us with consistent direction toward the goal of rehabilitation and improvement of our national resources."

May Be Ickes' Program

This thought smacks more than a little of the type of valley authority advanced enthusiastically by Interior Secretary Harold L. Ickes in his appearance before Congress last Spring on the Missouri Valley Authority bill (ELECTRICAL WORLD, May 12, 1945, page 110).

It would be striking if Ickes, who was conceded by some of his own people to be on the way out of the Administration only a few weeks ago, were now to be the author of the Administration's regional development policy.

NEWS OF THE WEEK

Sachse, Wimberly Named to FPC by Pres. Truman

Basil Manly Resigns to Become President of Atlanta Gas Light Co. —Harrington Wimberly, Oklahoma Newspaper Publisher, Will be Successor—California Railroad Commission Member Succeeds Scott

Appointment of two members to the Federal Power Commission was announced Wednesday by President Truman. Harrington Wimberly, Altus, Okla., newspaper publisher, will succeed Basil Manly, FPC chairman, whose resignation will become effective October 1. Richard Sachse, a member of the California Railroad Commission, will fill the vacancy caused by the resignation of John W. Scott. Manly's resignation came as a surprise, as did the two appointments.

Manly, who became chairman a year ago this month, resigned to become president of the Atlanta Gas Light Co., Atlanta, Ga., Scott resigned in June to enter law practice in Washington. Mr. Manly's term expires in June, 1948, and Mr. Scott's a year earlier.

In announcing his acceptance of the Atlanta Gas presidency, Manly disclosed that his resignation from FPC had been offered August 25 and accepted by President Truman Sept. 12.

"I am sorry that I feel obliged to accept your resignation of Aug. 25 because of the reasons you mention," the President wrote Manly. "Yours has been a long service in the federal government and much of it has come during the important events of the last decade. In accepting your resignation, to take effect Oct. 1, 1945, I wish to tender my personal thanks as well as those of the Nation for your long record of successful, efficient and patriotic service."

Since the commission elects its own officers—chairman and vice-chairman—it was not immediately clear who will succeed Manly as chairman. With Manly's resignation becoming effective October 1, Wimberly will take office thereafter. It was believed no new chairman will be elected until after Wimberly takes office.

Manly, a native of Greenville, S. C., attended the University of Missouri and was graduated by Washington and Lee University with the degree Bachelor of Arts in 1906. He was a fellow in political science at the University of Chicago from 1909 until 1911. During the First World War, he was joint chairman with former President William H. Taft of the National War Labor Board.

He was consultant with the U. S. Bureau of Labor Statistics from 1908 until 1912, later director of research and investigation for the U. S. Commission on Industrial Relations from 1913 until 1915. Thereafter he served as an economist with the Newspaper Enterprise Association, and as special assistant to the Federal Trade Commission before joining the National War Labor Board. After leaving the board, he was a newspaper correspondent until 1928, when he became special counsel for the Senate committee on campaign expenditures. In 1932 and 1933, he was Washington representative of the New York State Power Authority.

He was appointed to FPC in 1933, serving as its vice-chairman until 1936 and again from 1942 until he became acting chairman in June, 1944. He was commissioner-in charge of the National Power Survey and the Electric Rate Survey from 1933 to 1936, and under the "cheapest power" directive of Oct. 22, 1942, supervised the negotiation and renegotiation of war power contracts.

He was appointed vice-chairman of the National Defense Power Commission by the late President Roosevelt in 1938, and was chairman of the generation and distribution committee of the National Association of Railroad and Utilities Commissioners in 1939.

Manly was primarily responsible for execution of the agreements on electric power and natural gas under which the War Production Board and FPC split wartime jurisdiction of these services.

Mr. Wimberly, following his graduation from Oklahoma University in 1924 with a bachelor of arts degree, became advertising manager of the Altus (Okla.) Times-Democrat. In March 1925, he became editor and publisher of the Cordell (Okla.) Beacon, a weekly newspaper. He returned to the Times-Democrat in January, 1928, as business manager and became publisher in 1929, and owner in January, 1936.

He has served several years as director of the Oklahoma Press Association and was president in 1937-38. From 1940-43, he was a director of the Southern Newspapers Publishers Association. Since 1940, he has been a Regent of Oklahoma University.

Mr. Wimberly became chairman of the Democratic State Central Committee of Oklahoma in February, 1944.

Sachse an Engineer

A native of Germany, Mr. Sachse came to the United States in 1901 after having received most of his education in Germany. He was graduated with the degree of Civil Engineer by the Institute of Dresden, and with the degree of Structural Engineer by the Institute of Technology of Hanover.

Arriving in the United States, Mr. Sachse was first employed by the Western Electric Co. as a draftsman in Chicago, moving thence to the United Steel Corp. as plant engineer. Later, he became associated with the U. S. Reclamation Service of the Interior Department's Reclamation Bureau, working as assistant engineer on irrigation projects.

Thereafter he was affiliated with the Southern Pacific Railroad as draftsman and assistant engineer for about one year, leaving that job to do construction work with the Western Pacific Rail-

road's Sierra Division on a line between San Francisco and Salt Lake City. At the completion of this work, Mr. Sachse became office engineer for Western Pacific in its San Francisco office.

In 1912, when the California Railroad Commission was first given jurisdiction over utilities, Mr. Sachse, who was naturalized in that year, joined the organization as principal engineer, rising shortly to assistant chief engineer. After about one year with the Commission, he became its chief, a position he held for almost 11 years.

In 1924, he left the Commission to do consulting work, specializing principally in public utility matters, including electric, gas and transportation utility problems. During this time he was employed by the state of Nevada, the territory of Hawaii, the city of Los Angeles and other governmental subdivisions. He was consulting engineer on the Golden Gate and San Francisco Bay Bridges, handling traffic and transportation problems and making a study of the economics of the two structures. He also practiced before the Interstate Commerce Commission and other regulatory bodies.

In 1939, Mr. Sachse gave up consulting work and returned to state office, holding office on several state boards and heading the State Employment Commission and the State Division of Natural Resources concurrently from 1940 to 1942. In 1942 he was appointed to membership on the Railroad Commission to fill an unexpired term by former Governor Olsen. In January, 1944, he was re-appointed to a full six-year term on the Commission, and served as its chairman that year.

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FPC Chairman on Board for Atomic Energy Control

The chairman of the Federal Power Commission is to be a member of the board which will have control over the use and application of atomic energy under the terms of a bill introduced in the Senate by Brien McMahon, Connecticut Democrat.

The bill holds it "essential" that the use and application of atomic energy "be controlled by the United States for the benefit of the nation," and that "exploitation and use of such energy by persons other than the United States shall not be permitted except under government control and supervision."

To achieve these ends, the bill provides for a board whose chairman would be appointed by the President and whose membership would also include the Secretaries of State, War, Commerce, Navy, and Labor, and the Attorney General.

Puget Sound Power Ruled Not a Utility

FPC Action Clears Way for Sale of Properties to Public Utility Districts in Western Washington

The Federal Power Commission ruled last week that the Puget Sound Power & Light Co. is not a "public utility" within the meaning of the Federal Power Act and consequently dismissed an application by the company for authorization to sell all its electric properties and to issue notes in the amount of $15,125,000.

Early this week, the offer made by western Washington public utility districts through Guy C. Myers to purchase Puget Sound Power & Light Co. properties, (ELECTRICAL WORLD, August 25, Page 7) was still being studied by officials of the utility.

While company officials stated no steps had been taken to submit the offer to stockholders for consideration, a spokesman for Mr. Myers expressed confidence in progress of the deal.

"There is a great amount of detail work which must be done in transactions of this nature," he said. "When the initial steps are completed, we are satisfied that the logical continuity of moves which will lead to the conclusion of the deal can take place in rapid order."

FPC's order dismissing the company's application held that with the exception of certain "war-emergency" transactions which do not make the company a "public utility" under the meaning of the act, Puget Sound does not own or operate facilities for the transmission or sale at wholesale of electric energy in interstate commerce. Thus, the proposed sale of its facilities is not subject to Sections 203 and 204 of the Federal Power Act.

The company was granted a certificate of exemption from the Act in February, 1943, as a result of its interconnection with the Washington Water Power Co., the City of Seattle municipal system, and the Bonneville Power Administration.

The exemption, issued under Section 202 (d), was to extend until 90 days after cessation of hostilities and was based on war requirements. In addition, the company was later authorized to transmit and receive energy to and from Canada for specific purposes.

Westinghouse Office Union Members Stay on Strike

After being out one day, then going back for a day, 12,000 white-collar members of the Federation of Westinghouse Independent Salaried Unions were back out on strike in the middle of the week.

The strikers, seeking an incentive pay bonus similar to that received by production workers, were told by the War Labor Board that their action threatened a serious interference with the orderly transition to a peace-time economy and full employment.

Union officials after ordering the men back reversed themselves, accused the WLB of "double talk," and ordered the strike to go on. Plants and offices of Westinghouse Electric Corp. in six states are affected.

Westinghouse officials said the office workers have received a 30 percent increase in average base pay since January, 1941, and a bonus now was unjustified.

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New Canadian Line to U.S.

The British Columbia Electric Railway Co. has received permission from the British Columbia government to construct a 230-kv. transmission line from Everett, Wash. to Vancouver, B. C., to hook up with the Bonneville Power Administration system at Bonnington Falls. Transformer facilities will be provided at the Canadian terminal of the line to deliver power at the proper voltage.

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Toledo Edison Ups Wages

Approximately 700 employees in the operations department of Toledo Edison Co. have been granted an increase of 10 cents an hour, retroactive to October, 1944. The company and the Toledo local of the International Brotherhood of Electrical Workers last October submitted a joint application to the War Labor Board for the increase. When WLB restrictions were withdrawn, Toledo Edison voluntarily granted the raise.

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Surplus Property Sales

Surplus property sales up to July 31 as announced by the Reconstruction Finance Corporation included:

Generator-set units—total cost, $8,767,000; total sales, $833,000; on hand, $6,715,000, cost price.

Other electrical machinery and equipment—cost, $7,191,000; sales, $1,365,000; on hand, $4,917,000.

Rubber-insulated copper wire—cost, $950,000; sales, $188,000; on hand, $635,000.

St. Lawrence Project Will Start Fight in Congress

Expected Endorsement of Project by President Truman Will Lead to Dispute as to Legislation Required—Proponents Say Majority Approval by Both Houses Required—Foes Treat Measure Like a Treaty

President Truman early this week was preparing a recommendation to Congress on construction of the St. Lawrence Seaway and power project which was expected to be an endorsement, but advices from the Capitol indicated that the first dispute will not be on the project itself but on how it shall be handled in Congress.

Late last week, the President told newsmen that he might have an announcement on the project within a few days, adding that his ideas did not tie in with the development of any other watershed.

Aiken Hopes for Approval

Sen. George D. Aiken, Vermont Republican and leader of the pro-St. Lawrence contingent for some years, told ELECTRICAL WORLD he hoped that the project would be authorized and put at the top of whatever public works program may be given funds. He said its principal values lie in the work it would provide, in its "opening" the mid-west, and in the large amount of power it would develop.

Aiken indicated that legislation, bearing bi-partisan sponsorship, would be introduced this fall calling for approval by both houses of the executive agreement of 1941 under which the seaway and power project were agreed to by the U. S. and Canadian governments.

Aiken indicated further that the legislation might be a simple approval of the agreement, leaving for subsequent action the appropriation of funds and the transfer of proposed hydroelectric power equipment to the state of New York.

This, Aiken said, might be the answer if opposition arose to the cession of the power plant to New York. Such transfer has been anticipated in recent legislation on the project. Actually, Aiken continued, he knows of no opposition whatsoever to the projected transfer. Under legislation proposed by Aiken and other members of Congress in the past, New York would pay about $93,000,000 for the power facilities over a period of 50 years.

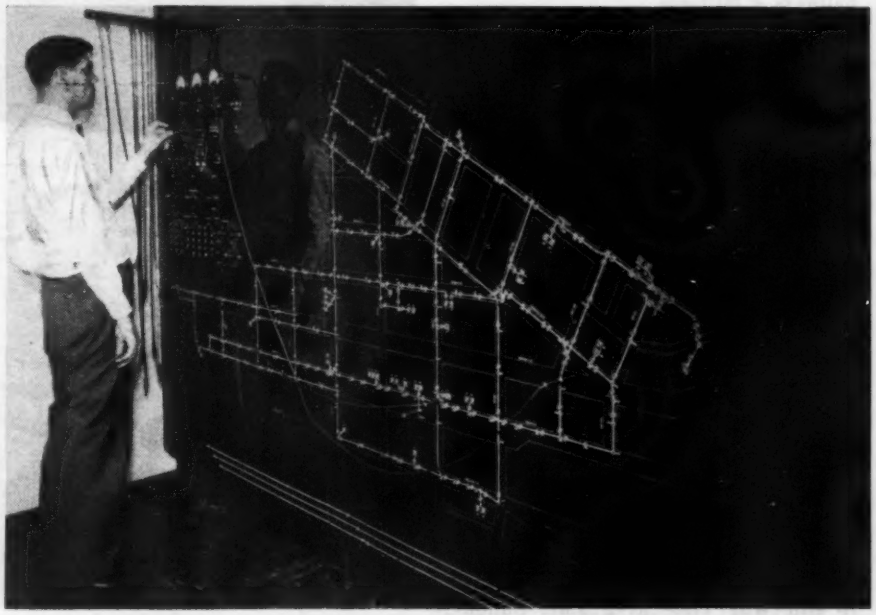
Aiken insisted that approval of the executive agreement of 1941 by a simple majority vote of both houses would suffice, despite equally obdurate insistence by other members of Congress that the matter can only be handled as a treaty, requiring a two-thirds majority of the Senate. While he conceded that two sections of the executive agreement, one governing navigation on the Great Lakes and another relating to the installation of some experimental facilities at Niagara Falls, might require approval in treaty form, the remainder of the agreement which contains the heart of the project, Aiken said, is clearly subject only to majority approval by both houses.

The U. S.-Canadian treaty of 1909, he said, can properly be considered to permit, without further treaty action, all sections of the 1941 executive agreement except the two previously mentioned.

Aiken would not confirm an earlier report that proponents of the St. Lawrence would use as one of the arguments in its favor the assertion that the cheap power available in the river would help to repay the Northeast for the benefits it lost when the Interstate Commerce Commission recently acted to remove freight rate inequalities between the Northeast and other sections of the country. He indicated, however, that such a consideration might conceivably bolster support for the project in the Northeast, where, he said, the industrial community had been developed in part upon the competitive advantage available under the freight rate differentials.

Aiken added that if the project were to be constructed, New York City and Albany shipping interests undoubtedly would insist on construction of the Champlain cut-off, which would decrease by about 1,300 miles the water route from Buffalo to New York City. He said he did not believe Champlain cut-off would be included in whatever legislation authorizes the project, and added that he knew of no Canadian opposition to the cut-off, which would require two rather short canals and improvement of Lake Champlain to permit diversion of freight from the St. Lawrence to the Hudson not far northeast of Buffalo.

Sen. John Overton, Louisiana Democrat and a power on the Senate Commerce Committee which studied St. Lawrence legislation last year, told ELECTRICAL WORLD that his sub-committee had not come to any conclusion on whether the project should be dealt with as a treaty or whether it could be approved by other legislative means. First step of any renewed consideration, he said, would be a determination of this question. State Department experts testified last fall that a simple



CHATTANOOGA'S CALCULATING BOARD—Fred Baker, underground system engineer and designer for the Electric Power Board of Chattanooga, takes a check on the new calculating board for the EPB underground network system made under his direction. Any load condition in the field can be analyzed accurately and quickly on the board

majority vote of both houses would suffice, while a Constitutional law expert from Yale University took the position that the executive agreement of 1941 must be approved as a treaty. If the latter course were decided upon by the Commerce Committee, legislation would be sent to the Foreign Relations Committee.

The Senate rejected by 56-25 last fall an amendment to the Rivers and Harbors bill which would have authorized the project.

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Energy Sales in June Advance 2.2 Percent

Sales of electric energy to ultimate customers in June, 1945, totaled 16,604,722,000 kw.-hr., compared with 16,250,974,000 kw.-hr. in June, 1944, an increase of 2.2 percent, according to the report issued by the Edison Electric Institute.

Revenue from ultimate customers amounted to $277,255,200 in June, compared with $268,612,300 in June, 1944, an increase of 3.2 percent.

Classification of Sales, June, 1945 and Change from 1944

Kilowatt-hour sales June	Million Kw.-hr. 1945	1944	% Change
Residential or domestic	2,656	2,422	+9.6
Rural (District rural rates)	403	371	+8.4
Commercial or industrial			
Small light & power	2,478	2,454	+1.0
Large light & power	9,641	9,641	+0.0
Street & highway lighting	146	145	+1.2
Other public authorities	656	614	+6.8
Railways & railroads			
Street & interurban	358	350	+2.2
Electrified steam railroads	216	212	+2.0
Interdepartmental	50	41	+20.8
Total to ult. customers	16,605	16,251	+2.2

For the twelve months ended June 30, the annual use per customer advanced to 1,186 kw.-hr. from 1,117 kw.-hr. for the preceding year; the average annual bill to $41.15 from $39.65; revenue per kilowatt-hour dropped to 3.47 cents from 3.55 cents for the preceding year.

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War Time on Way Out

The House Interstate Commerce Committee on Tuesday approved a bill by Rep. Lyle Boren, Oklahoma Democrat, to end War Time at 2 a.m., Sunday, September 30. Acting Chairman Alfred L. Bulwinkle, North Carolina Democrat, promised quick action on the bill. War Time has been in effect since January 20, 1942.

Utility Sale, 20 Years Ago, Held Legal in New Mexico

Refusing to allow return to the city of Clovis in eastern New Mexico of utility properties it sold to the New Mexico Utilities Co. in 1925, the State Supreme Court recently upheld a district court decision legalizing the transaction.

Legality of the 20-year-old, $400,000 sale had been challenged by Clovis city officials, who asked return of the properties, on grounds that it was generally violative of the state constitution and that sale of electric and water facilities should have been submitted separately to voters.

Southwestern Public Service Co. now operates the Clovis utilities, having acquired them from their predecessor, New Mexico Utilities Co.

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July Energy Production Increased 0.9 Percent

Electric energy produced for public use in July 1945 totaled 18,952,193,000 kw.-hr., an increase of 0.9 percent when compared with July 1944, while combined production of utilities and industrial establishments of the country was 23,050,174,000 kw.-hr. during the same period, an increase of 0.4 percent from July of last year, according to a report issued by the Federal Power Commission.

Average daily production of electric energy for public use in July was 658,062,000 kw.-hr., a decrease of 2.2 percent when compared with the average daily production during the previous month, but an increase of 0.2 percent above July 1944.

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Will Limit Potomac River Plan to Flood Control

The Army Engineers' Potomac River flood control and power project, which drew angry objections from residents of Maryland and Virginia last spring when it was presented with plans for 13 power and multiple-purpose dams to cost an estimated $235,000,000, will finally be presented to Congress as a $2,000,000 flood control project containing provision only for local protective works at Waynesboro, Va., and Washington, D. C.

Before it can go to the Capitol, the project must be laid before the governors of affected states for at least 90 days.

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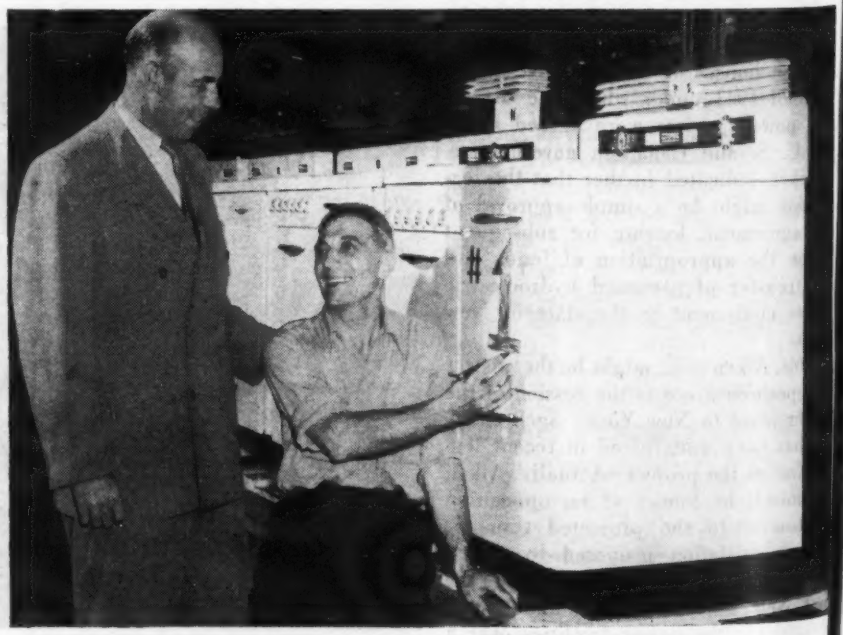
Energy Requirements Up

July 1945 electric energy requirements indicate a total of 18,672,965,000 kw.-hr., up about 121,000,000 kw.-hr. from June 1945 and a 0.9 percent increase from July of last year, according to figures released by the Federal Power Commission.



FIRST HOTPOINT RANGE—First electric range to be produced by Edison General Electric Appliance Co. for the open market came off the line in Chicago, August 30. Not unlike 1942 models the post-war ranges will go to dealers for use as samples and will be priced at or about 1942 levels. Ward R. Schafer, Hotpoint, vice-president left, joins production worker Virgil Casassa in celebrating the event

Engineers Witness New Breaker Tests

Roller-Smith Presents New Series at Siegfried Testing Laboratory—Heavy Back-Up Available

Roller-Smith's new TCR-5 series of oil circuit breakers for ratings up to 150,000 kva. was given its first witness test at the company's "on-the-line" high voltage testing laboratory in Siegfried, Pa., on September 8 and 9. Six tests were performed.

The 100 TCR-5 model rated at 7.5 kv., 600 amp., 100,000 kva. was put through a CO-15-CO test cycle. Actual average tests values recorded were 7,325 volts, 9,530 amp., and 121,000 kva. In the second test, the same breaker was tested at low voltage with high current. The test cycle was the same and the average actual values recorded were 2,220 volts, 21,830 amp., and 83,500 kva.

Third test was on model 150 TCR-5 which is rated at 15 kv., 600 amp., 150,000 kva. The test cycle was CO-15-CO at rated voltage and average test values shown on the oscillograph were 14,650 volts, 6,290 amp., and 159,200 kva. The fourth test was on the same breaker, likewise at rated voltage, but the test cycle was changed to simulate operating practice. The test cycle was OCO-15-CO-60-CO. Average actual tests values were 14,650 volts, 5,550 amp., and 140,500 kva.

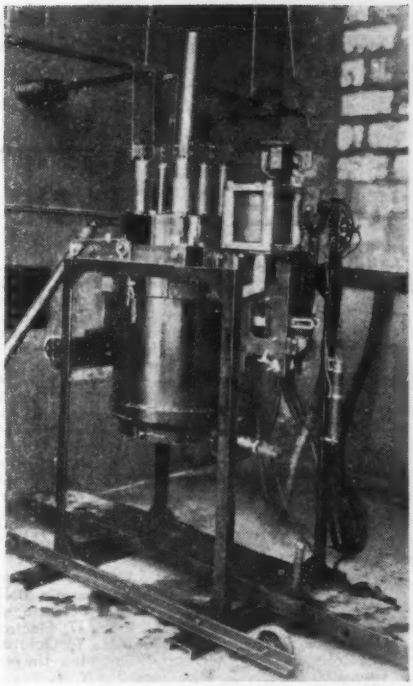
Results of Other Tests

Fifth test was also on the same breaker, energized at low voltage through a back-up breaker, and the test cycle was opening. Average actual test values were 3,775 volts, 24,300 amp., and 159,000 kva. The sixth was a close-open shot with average actual test values of 3,775 volts, 23,210 amp., and 151,600 kva.

Tests were witnessed by some 55 consulting, operating and industrial engineers. In each case the breakers operated satisfactorily and after each test the breakers were dismantled to inspect the mechanism and the contacts. Oscillograms indicated that the short circuit interruption time in the series of tests ranged from four to six cycles.

Prof. A. R. Miller, development engineer of Roller-Smith and designer of the new series of breakers, conducted the tests in cooperation with Dr. A. C. Bates, company's chief engineer. Prof. Miller described the arc-quenching features of the breaker which he calls "the exotherm principle of arc extinction."

The "on-the-line" testing laboratory is fed by a 900-ft., 66-kv. line from Pennsylvania Power & Light Co.'s 1,-



BREAKER IN TEST POSITION—Model 150 TCR-5 Roller-Smith breaker, rated at 15 kv., 600 amp., 150,000 Kva. in position after tests had been completed. One side is connected to the bus; the other is shorted and connected to ground

250,000-kva. capacity Siegfried substation. The reactance of the line is 0.114 and the reactance of the step-down transformer bank at the laboratory is 0.273. The test station is designed to limit the short circuit to 250,000 kva. or approximately 20 percent of the short circuit capacity available.

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Canadian Output Statistics

The Dominion Bureau of Statistics has released the following output statistics of Canadian central electric stations in thousands of kilowatt-hours:

Period	1945	1944
Six months	20,672,333	20,529,165
Primary	17,129,035	18,769,205
Secondary ...	3,543,298	1,759,960
Exports to U.S.	1,261,433	1,278,976
June	3,411,673	3,325,525
Primary	2,979,917	2,953,019
Secondary ...	613,756	372,506
Exports to U.S.	253,872	228,676
May	3,593,074	3,584,515
Primary	2,941,869	3,146,496
Secondary ...	651,205	438,019
Exports to U.S.	248,421	242,128

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New Distribution Center

All distribution department offices of the Ohio Public Service Co. in Warren, Ohio, will be consolidated in a new $250,000 distribution and service center about November 1.

9 Southwest Co-ops Plan Generating Plant

Action toward construction of a central generating plant for nine REA cooperatives in New Mexico, Colorado, and Texas which compose the Plains Electric Generating Cooperative, Inc., was started early in September.

At a meeting in Las Vagas, N. M., the organization authorized its manager-coordinator, Oliver Kimbrough, to apply to REA for sufficient funds to build or purchase a steam generating plant and necessary transmission lines to supply immediate needs of its members.

The plant would be built in the vicinity of the Colfax County, N. M., coal fields where mines have been shutting down because of increased use of oil instead of coal as locomotive fuel by the Santa Fe Railroad.

However, ultimate use of hydro-electric power from dams proposed for the Rio Grande and tributary streams is contemplated by the group. According to John R. Mutz, Region 5 resident engineer for the Bureau of Reclamation, a potential of more than 120,000 kw. of hydroelectric energy could be provided in New Mexico by projects already in existence plus several proposed ones.

Present dams are El Vado on River Chama, now used solely to store irrigation water, and Elephant Butte and Caballo on the Rio Grande, used for irrigation and power. Proposed projects are dams at Abiquiu and Guests on the Rio Grande, Chamiti on the Chama, and a proposed project to divert part of San Juan River waters into the Rio Grande.

Member organizations of the Plains Electric Generating Cooperative are: Farmers Cooperative, Clovis, N. M.; Roosevelt County Cooperative, Portales, N. M.; Bailey County Cooperative, Muleshoe, Tex.; Mora-San Miquel Cooperative, Mora, N. M.; San Luis Valley Cooperative, Monte Vista, Colo.; Springer Cooperative, Springer, N. M.; Kit Carson Cooperative, Taos, N. M.; Socorro Cooperative, Socorro, N. M., and Central New Mexico Cooperative, Corona, N. M.

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BPA Building Substation

Construction of a major substation at Longview, Wash., started early in 1942 but halted because of shortages in manpower and materials, has been resumed by the Bonneville Power Administration. The $1,600,000 project, which includes erection of new transmission lines, will provide a new link in integrating the northwest system.

Fluorescent Given Approval by Doctors

The Journal of the American Medical Association of August 25 published the following "official" opinion regarding the effect of fluorescent light on vision. This statement submitted to the Council on Industrial Health by the Joint Committee on Industrial Ophthalmology representing the Section on Ophthalmology of the American Medical Association and the American Academy of Ophthalmology and Otolaryngology, has been approved.

"Fluorescent lighting has been regarded by physicians and others as possessing harmful qualities not found in other forms of artificial illumination or in daylight. The Joint Committee on Industrial Ophthalmology after consultation with specialists in the production and use of light, holds the following opinion:

1. The ultraviolet energy from clear blue summer skylight is three to four times as great per foot-candle as fluorescent light.
2. Light from fluorescent lamps resembles daylight more closely than that from tungsten-filament lamps. This color resemblance to daylight is a desirable quality.
3. Infra-red energy found in fluorescent lighting as now manufactured produces no known physiologic effect except that due to heating. Fluorescent light generates less heat per candlepower than tungsten lamps.
4. Glare occurs in any system of lighting. Its solution rests with illuminating engineers.
5. Individual differences occur in the level of illumination (foot-candles) required to provide a satisfactory degree of visual efficiency and eye comfort. Twenty foot-candles is essential for such critical tasks as reading. Higher levels of illumination are desirable for prolonged seeing, for discrimination of fine details and where low contrast prevails. These standards can be readily maintained in working places through use of properly installed fluorescent lighting.
6. Excessive light may produce symptoms of eyestrain in susceptible individuals regardless of source. Constitutional factors should be corrected as well as the amount and kind of light.
7. Noticeable flicker is largely eliminated in modern fluorescent installations.

The conclusion was that fluorescent light is not harmful to vision. It should not cause eyestrain if properly installed and used."

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MEETINGS

International Association of Electrical Inspectors—Revised Listing:—Southwestern Section, Southern California Edison Co. Bldg., Los Angeles, Calif., September 19, and Pacific Gas & Electric Co. Bldg., San Francisco Calif., September 21; H. L. Gerber, secretary, Room 205, City Hall, San Francisco, Calif. Northwestern Section, Olympic Hotel, Seattle, Wash., September 24; W. L. Gaffney, secretary, Room 402 City Hall, Tacoma 2, Wash. Western Section, LaSalle Hotel, Chicago, Ill., October 15-16; F. H. Moore, secretary, 320 N. Meridian St., Indianapolis, Ind. Eastern Section, Hotel New Yorker, New York, N. Y., October 22-23; F. N. M. Squires, secretary, 85 John St., New York, N. Y. Southern Section, Baker Hotel, Dallas, Texas, October 29-31; A. M. Miller, secretary, 219 Governor St., Richmond 19, Va.

Electrochemical Society—Electro-Organic Division, Chicago, Ill., October 5; Electrothermic Division Columbus, Ohio, October 12; Electronics Division, Philadelphia, Pa., October 17; Electrodeposition Division, New York, N. Y. October 24. Colin G. Fink, secretary, Columbia University, 3000 Broadway, New York 27, N. Y.

Missouri Valley Electric Association—Fall sales conference, Hotel Continental, Kansas City, Mo., October 18-19. I. D. Pettegrew, director, 1004 Baltimore St., Kansas City 6, Mo.

Missouri Valley Electric Association—Fall accounting conference, Hotel Continental, Kansas City, Mo., October 24-25. I. D. Pettegrew, director, 1004 Baltimore St., Kansas City 6, Mo.

American Society of Mechanical Engineers—Annual meeting, Hotel Pennsylvania, New York, N. Y., week of November 25. Ernest Hartford, executive assistant secretary, 29 W. 39th. St., New York 18, N. Y.

Previously Listed

Maryland Utilities Association—Mid-year meeting, Lord Baltimore Hotel, Baltimore, Md., September 21. R. C. Brehaut, Secretary, 1100 H St., N. W. Washington, D. C.

Pennsylvania Electric Association—Annual meeting, Benjamin Franklin Hotel, Philadelphia, Pa., September 26-27; A. B. Millar, managing director, State St. Bldg., Harrisburg, Pa. Electrical equipment committee. (tentative),. Benjamin Franklin Hotel, Philadelphia, Pa., October 25-26; B. E. Hagy, chairman, Philadelphia Electric Co., Philadelphia, Pa. Systems operation committee, Penn Harris Hotel, Harrisburg, Pa., November 8-9; A. R. Deck, chairman, Metropolitan Edison Co., 412 Washington St., Reading, Pa.

Indiana Electric Association—Annual meeting, French Lick Springs Hotel, French Lick, Ind., September 26-28. E. F. Hauser, executive secretary, 1414 Circle Tower, Indianapolis, Ind.

Southeastern Electric Exchange—Engineering and Operation Section, Sir Walter Hotel, Raleigh, N. C., October 4-5; Commercial Section, Henry Grady Hotel, Atlanta, Ga., November 1-2. John W. Talley, executive secretary, 303 Haas-Howell Bldg., Atlanta 1, Ga.

Kansas Association of Municipal Utilities—Annual convention, Broadview Hotel, Emporia, Kansas, October 7-9. Edgar P. Schowalter, secretary-treasurer, c/o Board of Public Utilities, Kansas City, Kansas.

Edison Electric Institute—Prime movers committee, Statler Hotel, Buffalo, N. Y., October 8-9; transmission and distribution committee, Cleveland Hotel, Cleveland, Ohio, October 15-16; electrical equipment committee, Cleveland Hotel, Cleveland, Ohio, October 17-18; accident prevention committee, Lord Baltimore Hotel, Baltimore, Md., October 25-26; Col. H. S. Bennion, managing director, 420 Lexington Ave., New York 17, N. Y.

American Welding Society—Annual meeting, Pennsylvania Hotel, New York, N. Y., October 18; M. M. Kelly secretary, 33 W. 39th St., New York 18, N. Y.

Insurance Firm Sued for Turbine Damages

Wisconsin Electric Power Co. has filed suit against Continental Casualty Co., Chicago, in Milwaukee County Circuit Court seeking to collect a total of $99,628.22 for the repair of damages and loss of use of turbo-generator unit No. 1 at its Port Washington station under a policy insuring against damage to the machine by accident.

The definition of accident under the terms of the policy, quoted in the complaint is as follows: "Accident shall mean any breaking, burning out, rupturing or unusual or unexpected deforming of the Object or any part thereof which prevents continued operation or impairs the function of the Object which necessitates repair or replacement before its normal operation can be resumed and its normal functioning restored but which shall not include ordinary wear and tear. Cracks incident to ordinary wear or erosion shall not be constituted an accident."

Turbine Blades Damaged

According to the complaint the insurance company did not repair or replace turbine blades (stated cost $12,420.62) found ruptured on May 31, 1944 when the machine was opened to replace blades not involved in this suit. Occurence was not indicated in operation of the machine, it is stated, and couldn't have been detected in the exercise of due care. The complaint points out that the blades involved were installed new in 1943 and first used in the machine on the morning of September 3, 1943 when the turbine was started up. It was pointed out that the insurance on the machine went into effect at noon on September 3, 1943.

In a second cause of action the Milwaukee utility is seeking to recover $85,825 for 42.925 days loss of use of unit No. 1 as a result of the blade rupture and an additional $1,382.60 for concurrent loss of use of an East Wells St. Station boiler.

Continental Casualty Co. in its answer to the complaint alleges that any defects or damage to the blading was incident to ordinary wear and tear or erosion or "to causes other than accident as defined in the policy."

Among other things the defendant's answer denies that due notice of the blade rupture or the resulting loss of use was given. The insurance company also denies knowledge or information sufficient to form a belief that the turbine blades were new when placed in operation on September 3, 1943 or that the turbine was started, at that time, in a proper manner.

Ontario Hydro Opens School for Linemen

Recognizing the need for trained linemen if its five-year program of rural electrification is to be carried out, Ontario Hydroelectric Power Commission has opened a training school which will graduate approximately 50 junior linemen every three months.

Hydro municipalities throughout Ontario, through the Ontario Municipal Electric Association, have had an active role in bringing the new training plan into effect. It is expected that some of the school graduates will take positions with these utilities.

The school will also play an important part in training veterans of the armed services for positions in civil life. The Department of Veterans' Affairs is cooperating closely, and many of the students will be veterans. Enrollment, however, is open, within the number that can be accommodated, to any physically fit man who has a liking for outdoor work and has completed at least two years of high school.

Present buildings, although of a temporary character, are completely equipped. In addition to the school proper, there are sleeping and dining accommodations for both students and instructors.

The course is one in which the emphasis is definitely on the practical work which will be supplemented by lectures and visual educational methods involving the use of sound pictures.

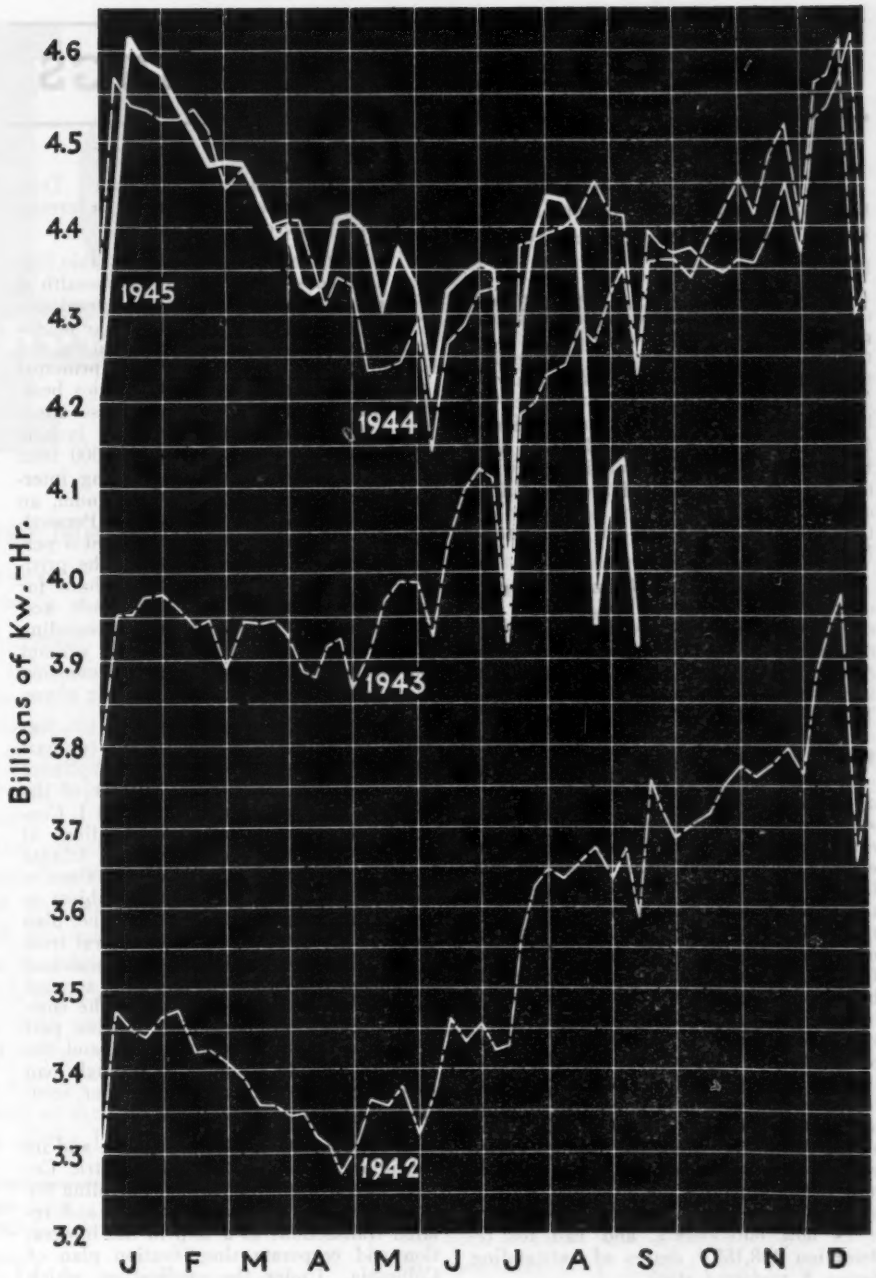
Hydro's personnel department will have direction of the school with S. K. Cheney as immediate supervisor and K. W. MacDermott acting as chief instructor. All those on the teaching staff have had experience in many phases of Hydro work, and it is probable that later training will be offered in other trades associated with system operations.

•

Government Mica Supplies Available for Purchase

The War Production Board has announced that purchases from government stockpiles of mica will be allowed pending removal of controls which now restrict private purchases in favor of government buying programs. The move is expected to speed reconversion of the small electric appliance industry.

Present government purchase restrictions will end November 30. Until normal purchasing can be resumed, government supplies will be made available to manufacturers.



Output Curve Takes Sharp Decline

Following the usual trend for the week containing the Labor Day holiday, the electric output curve dropped sharply during the week ended September 8, 1945, according to figures released by the Edison Electric Institute. The amount of electrical energy distributed by the light and power industry totaled 3,909,408,000 kw.-hr., compared with 4,137,313,000 kw.-hr. during the preceding week. During the week ended September 9, 1944, the amount of electrical energy distributed amounted to 4,227,900,000 kw.-hr., this year's figure representing a decrease of 7.5 percent.

Again the West Central states was the only group of the seven major geographical regions that reported an increase over the corresponding week of 1944, showing a gain of 2.2 percent.

Weekly Output Millions Kw.-Hr.

1945		1944		1943	
Sept. 8	3,909	Sept. 9	4,228	Sept. 11	4,229
Sept. 1	4,137	Sept. 2	4,415	Sept. 4	4,351
Aug. 25	4,116	Aug. 26	4,418	Aug. 28	4,322
Aug. 18	3,939	Aug. 19	4,451	Aug. 21	4,265
Aug. 11	4,395	Aug. 12	4,415	Aug. 14	4,288
Aug. 4	4,432	Aug. 5	4,399	Aug. 7	4,241
July 28	4,435	July 29	4,391	July 31	4,227
July 21	4,385	July 22	4,381	July 24	4,196
July 14	4,295	July 15	4,377	July 17	4,184
July 7	3,978	July 8	3,941	July 10	3,919
June 30	4,353	July 1	4,327	July 3	4,111
June 23	4,358	June 24	4,325	June 26	4,120

Percent Change from Previous Year

	Week Ending		
	Sept. 8	Sept. 1	Aug. 25
New England	— 11.0	— 6.6	— 6.5
Mid Atlantic	— 7.2	— 3.5	— 3.2
Central Industrial	— 13.6	— 12.2	— 13.7
West Central	+ 2.2	+ 1.5	— 3.7
Southern States	— 4.0	— 2.7	— 1.?
Rocky Mountain	— 2.8	— 1.4	— 7.0
Pacific Coast	— 3.6	— 5.9	— 6.1
Total United States	— 7.5	— 6.3	— 6.8

SEC DECISIONS–HEARINGS

The Securities and Exchange Commission in a series of orders recently issued affecting electric utility companies:

APPROVED SALE of New York State Electric & Gas Corp.'s natural gas production plants, transmission and distribution facilities in three New York State communities to Iroquois Gas Corp., a subsidiary of National Fuel Gas Co. The properties will be transferred for a base consideration of $125,000 and value of all additions since February, 1945. The communities in which the properties are located are the Village of Lancaster, the town of Lancaster and the Town of Alden, all in the State of New York.

APPROVED PROPOSED refinancing program of Public Service Co. of Indiana, Inc. The commission also approved the transfer by the company of its water, gas and Sheridan ice properties to a new company to be known as Indiana Gas & Water Co., Inc. The book value of the properties being transferred to the new company is about $14,540,000 which represents about 13 percent of the net assets of Public Service. In approving the transaction, the commission stated that it "will serve the public interest by tending toward the economical and efficient development of an integrated public utility system or systems." To finance the acquisition, Indiana Gas will turn over to Public Service 277,460 shares of its common stock together with the net proceeds from the issuance and sale at competitive bidding of $6,000,000 of first-mortgage bonds. Public Service's refinancing involves the issuance at competitive bidding of $48,000,000 of Series F bonds, borrowing of $13,000,000 from banks, and the issuance and sale at competitive bidding of 150,000 shares of cumulative preferred stock. With the proceeds Public Service will redeem its Series B, C, D and E bonds now outstanding, in the principal amount of $59,314,500; prepay $7,750,000 of serial notes now outstanding, and call for redemption 148,185.9 shares of outstanding Series A preferred stock.

HAS EXEMPTED from competitive bidding and approved the proposed private sale by American Power & Light Co. of $4,929,000 principal amount of 4⅛ percent sinking fund debentures, due 1979 of Florida Power & Light Co. and $4,900,000 principal amount of first mortgage bonds, 2¾ percent series, due 1975, of Texas Power & Light Co. Florida and Texas are both subsidiaries of American, which proposes to sell the Florida debentures at 104¾ and the bonds of Texas at 100 and to employ First Boston Corp. to find a purchaser for them on payment of commissions of one-fourth of one percent of principal amount. The commission found that the proposed sales are necessary to effect compliance by American with provisions of the Holding Company Act.

Applications Filed

AMERICAN UTILITIES SERVICE CORP. has asked for authority to redeem its $2,200,000 of collateral trust 6 per cent bonds, Series A, due Nov. 1, 1964, on next December 1 at 104½. To obtain funds for the redemption the company proposes to borrow $2,000,000 from the Harris Trust and Savings Bank of Chicago at an interest rate of 2¼ percent per annum.

PENNSYLVANIA POWER CO. and Ohio Edison Co., subsidiaries of Commonwealth & Southern Corp., have asked the commission to permit Pennsylvania to undertake a general program of financing, embracing the issuance and sale of $9,793,000 principal amount of 30-year bonds of a series bearing interest of 2¼ percent or less annually. Other steps contemplated include Pennsylvania's borrowing of $800,000 from banks on installment notes bearing interest of 2¼ percent or less per annum, an offer under which the holders of Pennsylvania's outstanding 42,000 shares of 5 percent preferred stock would have the privilege of exchanging them on a share for share basis for new preferred stock, and conversion of Pennsylvania's outstanding 110,000 shares of common stock without par value into 150,000 shares of common stock with a par value of $30 per share.

CONSOLIDATED ELECTRIC & GAS CO. has asked for authority to undertake a two-part voluntary plan to effect further compliance with provisions of Section 11 (B) of the Holding Company Act. Under Part 1, Consolidated proposes to sell its holdings of 240,145 shares of common stock of Atlanta Gas Light Co. to Southern Natural Gas Co. for a base price of $11,000,000, subject to certain adjustments. Part 2 of the plan involves the payment of its collateral trust bonds now outstanding in the principal amount of $14,716,000 at par, plus accrued interest. Proceeds of the sale of the common stock of Atlanta would provide part of the funds of this undertaking, and the remainder would be obtained through loan or sale or other disposition of other securities owned by Consolidated.

COLUMBIA GAS & ELECTRIC CORP. and its subsidiary, Cincinnati Gas & Electric Co. have filed a joint application, providing for the refinancing of Cincinnati Gas and related transactions as a step in the integration and corporate simplification plan of Columbia. Under the application, which was in the nature of an amendment to Columbia's over-all plan, Cincinnati will issue and sell under competitive bidding $45,500,000 of first mortgage bonds, the major portion of the proceeds to be applied to the redemption of all its outstanding indebtedness. Cincinnati will also issue 280,000 shares of new preferred stock which will be offered in exchange, to the extent available, for its 400,000 shares of outstanding cumulative preferred stock, 5 percent series A, on a share-for-share basis. Competitive bidding will also govern the preferred stock issue, and such shares as are not exchanged will be sold to underwriters. All unexchanged shares of the old cumulative preferred stock, 5 percent series, will be called for redemption at 107½. The joint application also covered a number of incidental transactions, involving two other subsidiaries, Miami Power Corp. and Union Light, Heat & Power Co.

UTILITY REPORTS

	Net Income 1945	1944
*Alabama Power	$3,945,737	$4,212,375
*Birmingham Electric	1,657,517	1,194,676
*Commonwealth & Southern and subs.	12,018,518	11,773,122
*Consumers Power	7,128,851	7,567,775
†Federal Light & Traction and subs.	1,053,428	1,106,250
*Georgia Power	4,870,752	5,265,436
†New York State Electric & Gas and subs.	5,449,581	5,624,492
*Ohio Edison	3,542,459	3,618,998
*Utah Power & Light and sub.	1,838,554	2,178,467

*Twelve months ended July 31.
†Twelve months ended June 30.

Wisconsin Gas & Electric Building Line, Substation

Plans for the immediate construction of a new 18.6-mile, 132-kv. transmission line and associated 10,000-kva. substation have been announced by S. B. Sherman, vice-president and general manager of Wisconsin Gas & Electric Co., Racine. Cost of the transmission line and substation, including right-of-way expense, was estimated at $368,000. With clearing of right-of-way already in progress completion of the project is expected in December, it was stated.

The line will constitute the initial link of an eventual 132-kv. interconnection between Port Washington power plant of Wisconsin Electric Power Co. and existing 132-kv. facilities of Wisconsin Gas & Electric Co., at Whitewater, Wis. However, its present purpose is to reinforce the bulk power supply to the northwest operating territory of Wisconsin Gas & Electric, Mr. Sherman stated.

The proposed line will be built by L. E. Myers Construction Co. and will be of H-frame double-shield-wire construction. Normal conductor size will be 266,800 cir. mil A. C. S. R. and normal span 850 ft. Several spans, over rough country, will approach 1,000 ft. and one valley crossing will be 2,375 ft. in length. This crossing will be supported on special five-pole deadend structures.

The western terminal of the line will be a new 10,000-kva. 132/26.4-kv. substation near the village of Slinger. Eastern terminal will be Saukville substation of Wisconsin Electric Power Co.

New Alberta Rural Line

Northland Utilities, Ltd., which recently acquired the interests of the Dominion Electric Power, Ltd., in Alberta, has begun construction of a 20-mile line from its plant at McLennan to Girouxville as the first step towards electrifying the Peace River area in Alberta.

HOW

DESIGN · CONSTRUCT · OPERATE · MAINTAIN

Fly-Ash Collected by Novel Method at Tulsa

W. E. KINNEBREW
Engineer, Production Dept., Public Service Co. of Oklahoma, Tulsa

Two attempts to eliminate fly-ash from stack gases at Tulsa station of Public Service Co. of Oklahoma, incident to the installation there—in 1942—of spreader stokers on five 100,000-lb. per hr. boilers, and subsequent operation at increased ratings ended in failure due to mechanical and chemical causes before the present, somewhat novel, scheme of fly-ash disposal was conceived.

The first attempt to reduce the fly-ash content of stack gases at Tulsa station, by putting them through a water-box type scrubber, failed when SO_2 in the flue gas combined with water to form sulphurous acid and ate away the box near the water line.

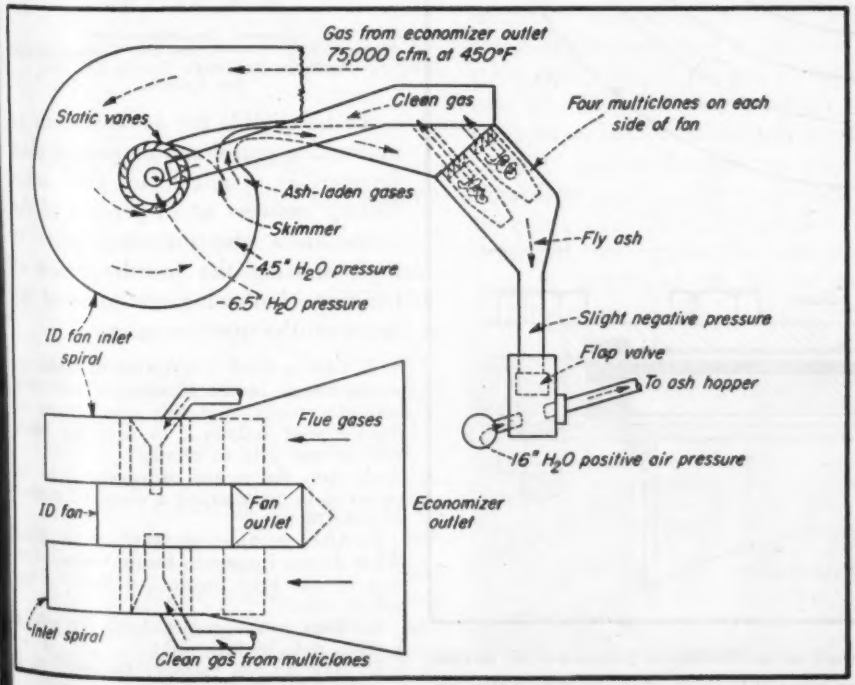
Attempts to fit the induced draft fan inlet with a spiral inlet box and skimmer that would divert fly-ash and cinders to a cyclone separator failed due to excessive wear on the cyclone and improper seal on the ash discharge.

The present scheme for collecting fly-ash involves the use of a spiral inlet and skimmer on the induced draft fan inlet to divert ash and cinders to a bank of four "multiclones" which separate the fly-ash and return the clean gas to center of the spiral inlet of the induced draft fans. Since the suction is lower (—4.5 in. of water) at the outside or skimmer portion of the I.D. fan inlet spiral than it is at the center (—6.5 in. of water) a positive pressure differential of about 2 in. of water is established across the multiclones, insuring circulation of gas through the multiclones.

Fly-ash precipitated from the flue gas in the multiclones drops by gravity into a pipe-type "hopper" fitted with a flap valve at the bottom. This valve drops open automatically when the head of ash above it exceeds the pressure differential across the flap. Ash discharged in this manner from the hopper is picked up by an air line and carried to a receiving hopper elsewhere in the plant or back to the furnace if it contains unburned carbon.

It is estimated that ash escaping through the stack ranges from 10 to 30 microns in diameter with the bulk of the particles about 10 microns.

This scheme of fly-ash disposal being used at Tulsa station had not been in operation long enough for final conclusion to be drawn as to its efficiency, however, experience thus far has been favorable.



SYSTEM USED AT TULSA STATION to collect fly-ash from flue gas

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Acid Resisting Paint Trims Maintenance

Automatic sump pump parts and fittings have been seriously corroded, even "eaten away," by the water which seeps through coal and cinder piles into the manholes of Chester Station yard of the Philadelphia Electric Co. The pipes through which the water flows and the channel iron which is below the water line in the manholes are similarly attacked. Noticeable effects have resulted in as short a time as three weeks.

Recently pumps, pump parts, fit-

tings, pipes and channel iron have been covered with a coat of acid-resisting paint as suggested by Arthur Torricellas of the Transmission and Distribution Department, which has increased the life of these equipment parts and fittings up to 600 percent.

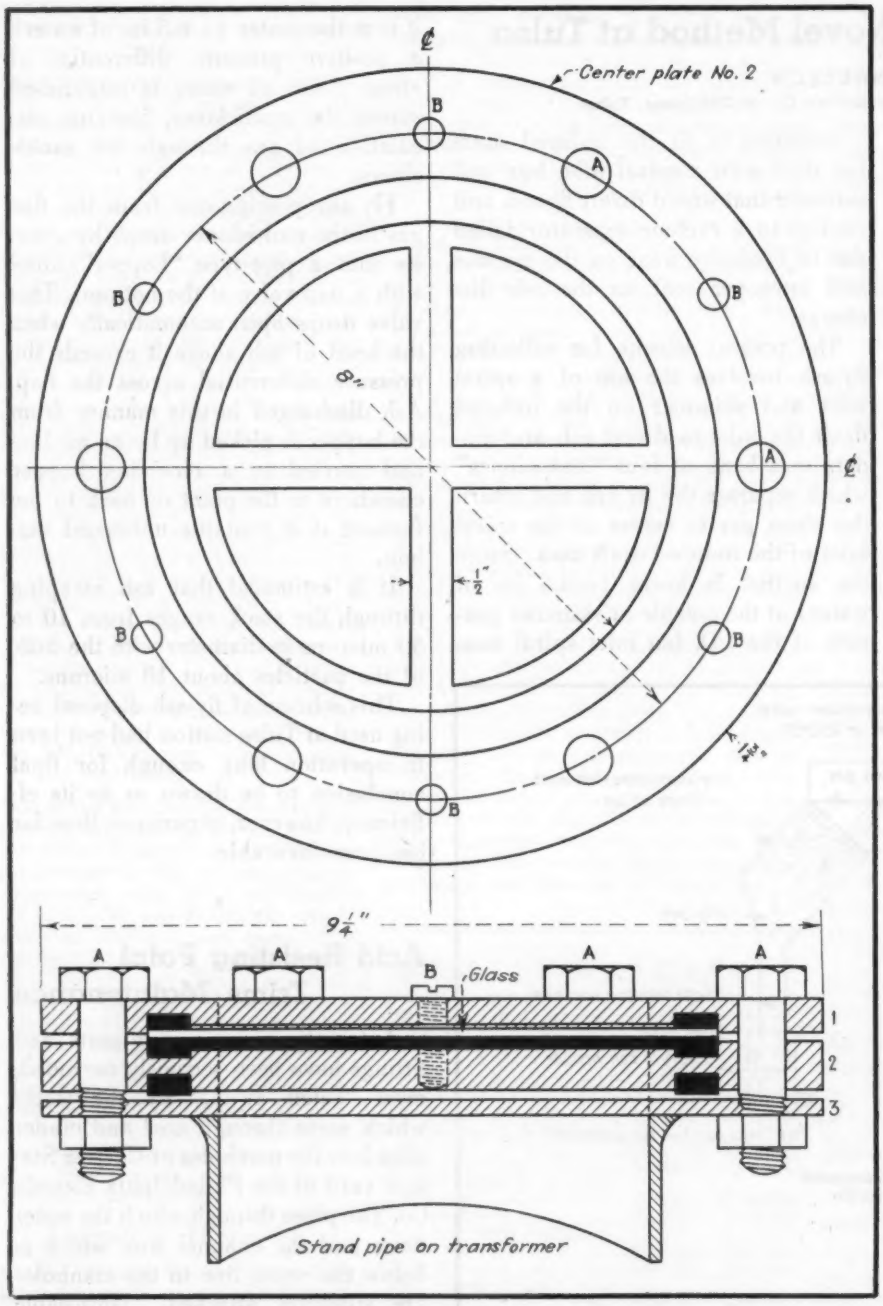
Previous to using the paint, much time and material was used in maintenance work; since the application of paint, this has been reduced to a monthly inspection.

•

One-Way Glass Relief Flood-Seals Transformer

Among measures to avoid the flood wetting of power transformers, the Duquesne Light Co. has been pressure testing its units to assure tight gasketing and it is planned to shut off breather openings on predictions of high water.

One location, however, serving an important war load is at such elevation that the three 2,000-kva. units may be completely submerged. These units are conservator type with the conventional vent pipe and glass diaphragm. It was felt with the breather plugged, that combined external water pressure and reduced internal pressure due to loss of load and water cooling, might cause rupture of the glass with resultant entrance of moisture. To avoid this, a Uni-Directional glass vent diaphragm was devised as shown in the sketch.



GRID CUSHIONS GLASS against external pressure in uni-directional pressure-relief device for use on conservator-type power transformers exposed to flood. A = 9/16-in. holes for ½-in. mounting bolts (6). B = Drill and tap for ¼ by 20 assembling bolts (6)

An additional steel plate (2) was constructed with cross members in the center opening which provide a firm cushioning back-up for the glass diaphragm against external pressure. Both plates (1) and (2) were recessed to trap gaskets and allow a metal to metal fit, avoiding over or under compression of the gasket material which is resin bound cork.

Assembly bolts (B) were provided so that the unit was shop assembled and could be readily mounted in the field on the vent pipe, using bolts (A) to complete the installation. Shop pressure tests were satisfactory in that the internal pressure required to rupture the glass was normal, while the assembly was found to withstand an external pressure of 35 lb. per sq. in. without the glass cracking or rupturing.

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Oral Tests in Lineman Training—III*

C. T. MALLOY

General Superintendent
Transmission, Distribution and Communication
Southern California Edison Co., Ltd.
Los Angeles

To be eligible for advancement an apprentice patrolman or second class lineman is required to give satisfactory answers to 75 percent of the items on a questionnaire, prior to their starting the fourth period of training. Following are some of the items on the questionnaire.

1. A. Give a brief description of what you would check before climbing a pole with several circuits, and tell what might influence your judgment in deciding which side of the pole to climb.
2. A. Are there any advantages to be obtained in maintaining a standard method of construction?

B. After completing work on a pole: What do you inspect to assure yourself that nothing has been overlooked and that the job is safe?

C. What is the proper depth for setting a 60-ft. pole in firm soil?

D. How do you measure the depth of a

* Third of a four-article series which began in ELECTRICAL WORLD, August 18, 1945.

hole for a pole on the side of a hill?

3. A. At what percentage of the rated breaking strength is hemp rope considered safe for working loads?

B. If it is necessary to apply a strain on a tower at other than the crossarm: How is this position determined to prevent damage to the tower?

C. How would you rig a line to prevent undue stress on the end of a tower crossarm when raising a heavy load?

4. A. Is it necessary to oil the wire rope used in line work when it is in use regularly?

B. Why is it necessary to maintain the wire rope on a drum tightly and closely wound?

C. What extra precautions must always be taken by the truck driver when it is necessary for a man to work on a wire that is supported by a winch line.

5. A. Why must a pressure-treated pole be set with extra care when being raised through energized lines.

B. When do you consider it necessary to take a circuit out of service when raising poles?

6. A. If you find an emergency condition that requires the line to be taken out of service for repairs: Whom do you call to make arrangements?

B. How do you test the line to be sure it is "dead"?

C. The pole to be grounded has a phone line, secondary, and a primary circuit below the line to be grounded. Describe how you would apply the ground.

7. A. What would you do with a man who had fainted?

B. What would you do in case you were bitten by a rattlesnake?

C. How would you take care of a sprained ankle?

D. Name the major pressure points to stop bleeding.

8. A. What is the standard arm spacing for 66 kv. on wood poles?

B. When installing 3-bolt clamps and more than one is used at the same location: Should the clamps be separated?

C. Why are double-arms installed with the ends pulled closer together than at the pole?

9. A. What must be inspected at each tower or pole when making a patrol?

B. What conditions, other than line conditions, must be reported when patrolling a line?

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Duct Temperature Test Procedure

An eastern power company's routine covering taking of duct temperatures and recording such data for action or otherwise is designed to establish responsibility for this work and specify detailed procedure. The company's maintenance engineer is in charge and the meter department makes readings on his request. Before July 15 annually he furnishes the meter foreman with a list of locations where duct temperature readings are to be taken, stating in each case the manhole location, number and duct number. Readings are taken as soon as possible after July 15.

When listing the above, the maintenance engineer consults with the general line and cable splicing foremen, maintenance supervisor, technical assistant (special tests and records) and any other having pertinent information as to possible points where cables may be overheated. The meter foreman is responsible for the accuracy of the readings at the time and place specified, and assigns a man to do the work. Readings are made with a Leeds & Northrup temperature indicator (potentiometer type), inserting thermocouple leads into the duct for about 10 ft. Readings are made after five minutes, and then at 1-min. intervals until three readings are consistent within 0.5 deg. C.

1	2
11	12

1	2	3	4	5
11	12	13	14	15
21	22	23	24	25

FIG. 1—METHOD of duct numbering

Field data are entered on a 5½-in. by 4⅜-in. slip. The position of the duct is indicated by number. The upper left hand duct, as seen from the manhole, is numbered 1, the next to the right 2, etc., to the end of the top row of ducts. The left-hand duct in the second row from the top is numbered 11, that in the third row 21, etc., regardless of the number of ducts in the row above. Thus, if four ducts are arranged two by two, they are numbered 1, 2, 11 and 12. Twelve ducts in three rows would be numbered 1, to 5, 11 to 15 and 21 to 25. Completed duct temperature readings are given by the meter foreman to the maintenance engineer, and then transferred to the permanent 3-in. by 5-in. card for filing. These cards are filed alphabetically according to streets where manholes are located. The maintenance engineer notes any duct temperatures in excess of 45 deg. C., and then destroys the field slips. He is responsible for necessary action to relieve duct temperatures in excess of this amount.

_____ ELECTRIC CO.–DISTRIBUTION DIVISION
DUCT TEMPERATURE READING

M.H. _____
ORDERED BY _____ DATE _____ 19____
CCT. NO. _____ DUCT NO. _____
DIRECTION FROM M.H. _____
FEET IN DUCT _____
TEMP. IN M.H. °C. _____
WEATHER CONDITIONS _____
DUCT TEMP. °C. 1st _____ 2nd _____ 3rd _____
AVERAGE _____
REMARKS _____
_____
DATE _____ TIME _____ A.M. P.M.
SIGNED _____

FIG. 2—DUCT temperature reading slip

_____ ELECTRIC CO.
DISTRIBUTION DIVISION
DUCT TEMPERATURE RECORD

M.H. No.	Duct No.	Direction To
Date	°C	Remarks	Read By

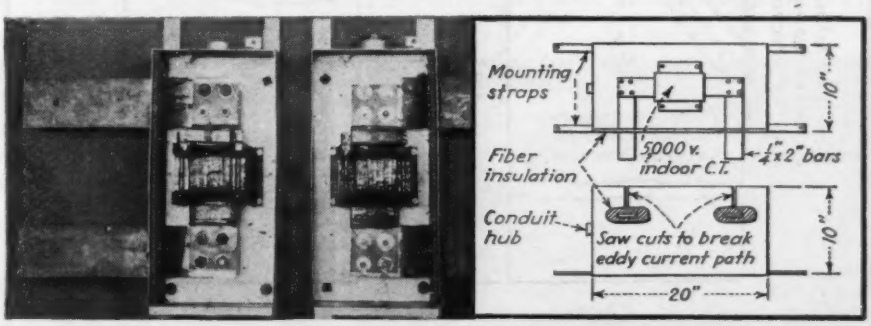
FIG. 3—RECORD of duct temperatures for distribution department file

•

House Indoor C.T. in Meter Enclosure

Conventional metal outdoor meter enclosures are being used by Kansas Gas & Electric Co., Wichita, to adapt 5,000-volt, indoor current transformers for outdoor service on 500-volt circuits. This practice is a temporary expedient necessitated by inability to secure outdoor current transformers at the present and the desire to continue outdoor meter installations.

Current leads, consisting of ¼-in. by 2-in. copper strap, are brought into the enclosure through openings in one side of the meter box. Insulation between these leads and the enclosure consists of a 5-in. by 16-in. by ⅜-in. strip of fiber bolted to the inside of the enclosure as shown. Although the transformer is rated 5,000 volts, its use is restricted to 500-volt circuits because of limitations imposed by clearance between the primary circuit and the metal enclosure.



INDOOR CURRENT TRANSFORMER which is mounted in conventional meter enclosure does wartime service outdoors at reduced voltage

Precast Bases Stocked for White Way Units

Where it is necessary to install one or two boulevard lighting standards or a foundation for an existing standard that is damaged, availability of precast reinforced concrete foundations that can be installed "ready made" offers opportunities to complete the job quickly and at low cost. It is not necessary to make the usual two trips to the job; one to prepare the excavation and pour the concrete foundation or base, the other to erect the standard.

Precast concrete street light foundations have been used by the Detroit Edison Co. for some time to take advantage of these benefits. The accompanying drawing shows the design of one of several concrete foundations used.

It should be pointed out, however, that the principal cost advantage from the use of precast bases obtains where only one or two bases are to be installed in a given location. Where a series of standards are to be erected there is usually enough other work involved to keep workmen busy during the drying period for the concrete. Precast bases offer another advantage in winter time by making it unnecessary to protect fresh concrete from freezing.

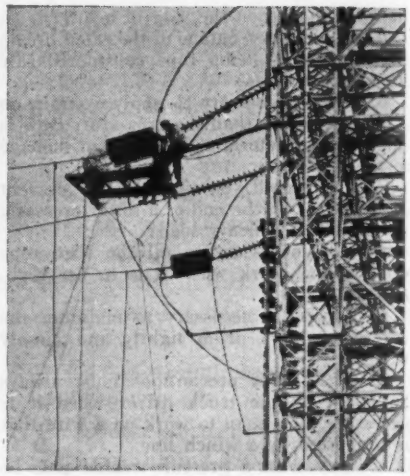
In some Detroit Edison foundation designs two horizontal holes are provided through the base below the ground level to lighten the base and give a somewhat better holding power. All designs are provided with drain hole to carry water from the anchor bolt casting in the top of the base to below the frost line.

•

Rigging for Tuning 230-Kv. Wave Traps

Several methods tried and different approaches to the problem of getting at wave traps mounted in 230-kv. line conductors has led Pacific Gas & Electric Co. to use the platform and rigging illustrated. A platform of suitable size is hoisted and suspended from the conductor at either side of the trap. A board placed between this and the tower gives workmen easy access.

If frequency channels are changed these wave traps used in conjunction with carrier telephone and relaying must be re-tuned and occasionally it is necessary to work on them for this or other purposes. Working from the end of a long boom, from ladders and other methods tried have been discarded as unsatisfactory and unsafe.



PLATFORM AND RIGGING for working on wave traps mounted directly in 230-kv. conductors. Working from a ladder or boom proved unsatisactory

•

Gloves and Blankets Sealed by Adhesive Tag

D. S ROUSH
Pennsylvania Edison Co., Altoona

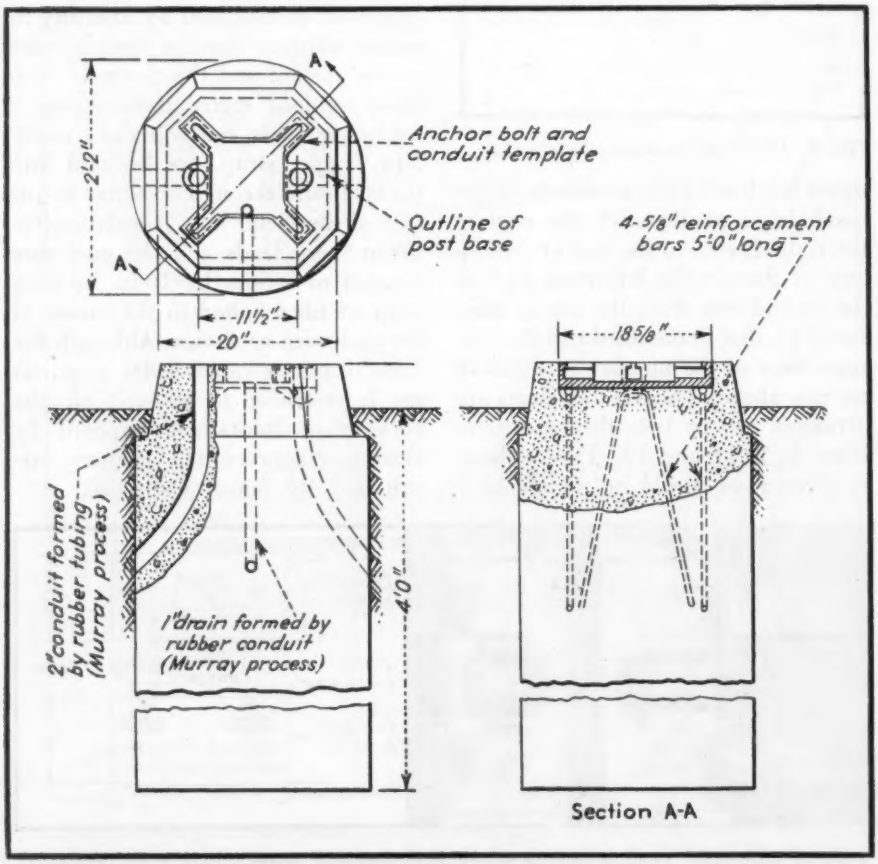
Tested rubber safety devices are labeled rather than marked with indelible ink as was formerly done to indicate acceptability after the test. Experience indicated that discoloration in service often made the serial numbers and approval dates illegible.

FLEXIBLE TAG carries approval date (year and month) and serial number

•

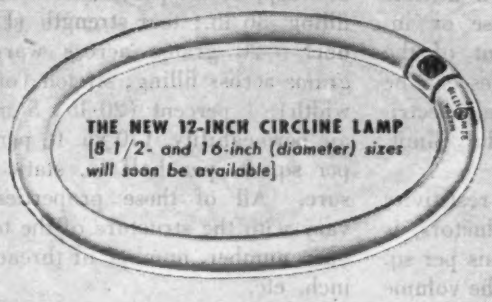
The labels used are Orrsell; they are 1½ in. in diameter and are rubbery and flexible in nature. The back is provided with an adhesive surface that holds the label on; none applied to gloves have come off in use when properly attached with rubber cement to gloves.

There are twelve small circles for

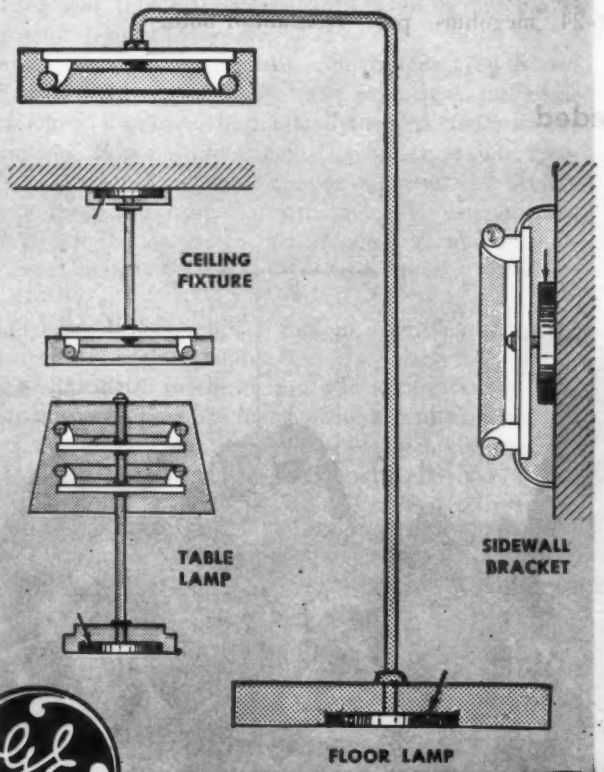


DESIGN OF PRECAST CONCRETE BASE for street light standards

An Unusual Ballast for an Unusual Lamp



A few suggested applications of ballast and lamp



The disk shape enables you to use the Circline fluorescent lamp to fullest advantage in your new designs

THIS new ballast is functionally designed for easy use in your new portable lamps and decorative lighting fixtures.

The center hole of the ballast facilitates mounting on the stem of portable lamps. The ballast can be easily concealed in lamp bases, or in wall and ceiling fixtures. Connection to the fluorescent lamps is made by threading the ballast leads through the lamp stem.

This ballast is available in uncorrected- or high-power-factor, single-lamp ratings for use on 110- to 125-volt circuits. The uncorrected-power-factor design is 6 inches in diameter and 1 3/8 inches in height. The high-power-factor unit, of the same height, is 7 inches in diameter.

Write today for a copy of Supplement No. 3 to Publication GEA-3293F. It is a "must" for your file of postwar lighting ideas. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

BALLASTS
LAMPS
STARTERS
LAMPHOLDERS
CABLE
for DEPENDABILITY in fluorescent lighting

Buy all the BONDS you can —and keep all you buy

GENERAL ELECTRIC

the twelve months and another group of numbers for the years. These are punched through with a hand punch and other punches perforate the figures of the serial number across the center before attaching the label.

In the case of the gloves, the seals are attached high on the cuff on the outside. Gloves are further sealed in canvas bags or envelopes that are not broken until the lineman is ready to use the gloves.

Handling of linehose often resulted in peeling off these labels when the lengths were removed from the truck compartment. In this instance the serial number and approval indications are applied by burning them into the surface by means of a Post electrical pencil in series with a 75-watt lamp.

•

Treatment Developed for Flash Burns

A simple treatment has been developed for "flash burns" such as are caused primarily, in shipyards and other industrial plants, by the ultraviolet light produced when the welder strikes his arc, according to *Glycerine Facts*.

As reported by K. A. Koerber in the American Journal of Surgery, after preliminary treatment in the plant clinic, the patients are given for home use a dropper bottle of "Welder's Drops," compounded as follows:

Ingredient	Percent
Pontocaine	0.25
Ephedrine sulfate	0.25
Menthol	0.10
Glycerine	5.00
Boric acid solution to make	100.00

•

Properties of Tape Electrically Conductive

W. O. JELLEME
Director of Development
Pacific Mills, East Newark, New Jersey

Textile tape that can be given comparatively wide range of electrical conductivity has been announced as a development of the cotton and rayon division of Pacific Mills. The tape is still in the experimental stage and is not yet ready for marketing. The corresponding range of electrical resistance is from 10^6 megohms of the dry, untreated material down to a few thousand ohms for the most completely treated material. It is considered that this conductive property renders the material effective for electrostatic flux grading, discharging of static accumulations, elimination of corona, etc. Furthermore, the fact that the tape is a textile, enhances its value as an electrical shielding tape over the more commonly used metal tapes because of its properties of flexibility, elasticity, stretchability, etc. It can be wound tightly around cables, especially at joints that are of irregular shape, where it will conform to the movement of a flexible cable without coming loose or inhibiting the free movement of the cable. In addition all edges can be overlapped to eliminate high electrical edge stress without unduly limiting the cable flexibility.

Specifically, the surface resistivity of some of the better conductors, is of the order of 120,000 ohms per sq. in. per 7 mils thickness. The volume resistivity (in centimeters cubed) is approximately 48,000 ohms. Other samples have been made with surface resistivity of 16-24 megohms per sq. in. and volume resistivity of 1,400-2,300 megohm-centimeters.

Physical properties of the tape are essentially those of the textile material from which it is slit. Tapes of 7 mil thickness have tensile strength of 45 to 60 lb. per in. of width; others of 2.5 to 3 mil thickness show tensile strength of 35 lb. per in. of width. Other data for a typical 7 mil tape are: Thread count, 66 by 56; weight per sq. yd., 3 oz.: tensile strengths of warp, 56 lb. per in. of width; of filling, 36 lb.; tear strength (Elmendorf), 20 grams across warp, 12 grams across filling; stretch (of 1-in. width), 1 percent (20 lb., 5 min.); air permeability, 170 cu. ft. per min. per sq. ft. per half in. static pressure. All of these properties will vary with the structure of the textile, yarn number, number of threads per inch, etc.

Various types of surface finish are possible and, in addition, the finish can be made either oil resistant, water resistant or both.

• • •

Splicing Speeded

SPLICING OF THE 300,000-CIRC. MIL COPPER CONDUCTORS on the new 132-kv. Port Washington-Granville transmission line of Wisconsin Electric Power Co., Milwaukee, was speeded with half the previous effort by hooking the draw bench up, as shown above, to a gear train, using 8 ft. of 1-in. shaft and two 1-in. universal joints. Previous ratchet operation of the draw bench was slow and tedious. The winch was permanently mounted on the trailer used for hauling conductor reels, so was normally available at such places where splicing had to be done

For Foxhole Conditions

A HERMETICALLY SEALED PANEL INSTRUMENT with 5 Important Features

LOW, damp, wet holes protect lives, but cause equipment to rust, corrode, and fall apart. Where there is no cover, rain, dew, and fog soak into equipment—until, even in direct sunlight, it doesn't dry out for weeks.

To protect the sensitive element from fungus growth and the rapid deterioration caused by these conditions, our engineers developed a unique, hermetically sealed enclosure for this 2½-inch G-E panel instrument. Complete sealing, easy field servicing, accurate combat-proved element, and sturdy construction make this a superior instrument. It is designed to meet tentative Signal Corps Specification 71-3159, and is available for direct-current (DW-61) or radio-frequency (DW-62) service.

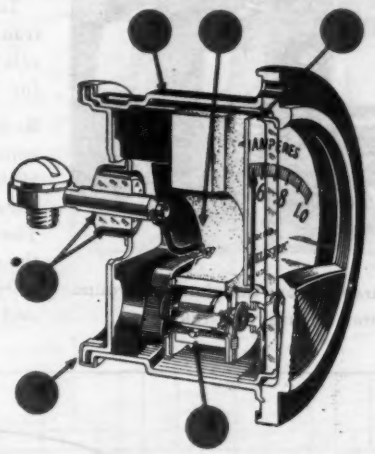
This new hermetic enclosure is another example of the way G-E measurement engineers have been, for nearly fifty years, overcoming difficulties in the design and application of precision instruments. There are many other recent G-E accomplishments, typical of which are the new 1½-inch instruments, the internal-pivot element, and new magnetic alloys.

For more complete information on this hermetically sealed instrument, ask the nearest G-E office for Booklet GEA-4429, or write to General Electric Company, Schenectady 5, N. Y.

HEADQUARTERS FOR ELECTRICAL MEASUREMENT

Buy all the BONDS you can—and *keep all you buy*

GENERAL ELECTRIC



- *Glass-to-metal Seals.* Vacuum-tight joints are assured by fusing the thick, special window into a matched metal ring, and by fusing an insulating glass bead to a matched metal stud and metal eyelet.
- *Steel Case.* Thorough shielding against stray magnetic fields, and complete protection from all adverse atmospheres are assured by a strong, vacuum-tight steel case.
- *Dehydrated.* Moisture, the major cause of corrosion, is reduced to a minute quantity by a special dehydration process.
- *Ease of Servicing.* This hermetically sealed device can be easily serviced by removing the crimped-over metal ring and withdrawing the base, with the element attached, from the steel case. To reseal the instrument, only a new metal ring and a simple crimping tool are required.
- *Internal-pivot Element.* High resistance to shock, fast response, and compactness are inherent in the internal-pivot-element construction—a design which has had a fine record of performance throughout the war.

Complete Line of Ratings

D-c microammeters to kilovolt meters, as well as r-f thermocouple-type and rectifier-type (a-c) instruments, are available.

THREE WAYS TO USE SPIRAL CORES

W. D. DISHNER, Formerly Electrical Engineer, East Tennessee Light & Power Co., Bristol, Tenn.-Va.

Two types of current transformers and a set of reactors for pole mounting, all made locally, utilize spiral cores salvaged from discarded transformers.

1. Considerable trouble due to absorption of moisture by standard dry wound-type current transformers in outdoor switch houses prompted a decision to make up some special designs in the shop. As constructed the main insulation is porcelain (Fig. 1). Cores were fabricated from the cores of burned-out transformers with spiral cores. The accompanying curve (Fig. 2) gives the v-a characteristic for excitation with 40 secondary turns on a 4-in. length core.

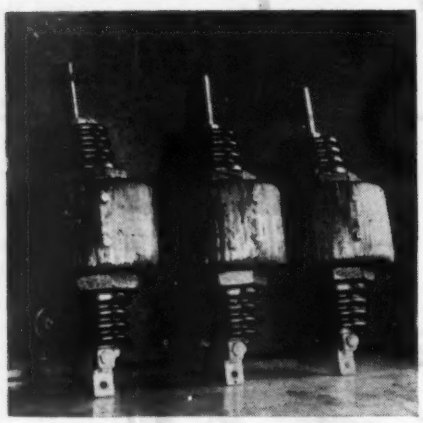


FIG. 1.—Three current transformers wound on spiral cores for use with relays

2. Similar practice was followed in connection with the bushing current transformers for a 15-kv. oil circuit breaker purchased without them. Since less room was available than in the case of the relay application, the cores were unwound, halved and reshaped to provide six current transformers. The two transformers per phase were connected in series. Fig. 3 shows the characteristics.

In both foregoing constructions the transformers were used with overcurrent relays only, hence no check was made for phase angle error.

3. Spiral-core reactors are used to prevent excessive loading on three 100-kva., 6900/575-volt transformers which are in parallel with three 250-kva. transformers. They add about 0.7 percent reactance to the smaller bank; impedance of the three 100-kva. transformers is about 3 percent and of the three 250-kva. units is 3.9 percent. The reactors were wrapped with several layers of cotton tape and treated with an asphalt-base varnish to prevent rusting. Estimates were made as to the amount of reactance needed, but they were finally checked by the trial and error method in the shop by loading them from a low-voltage source.

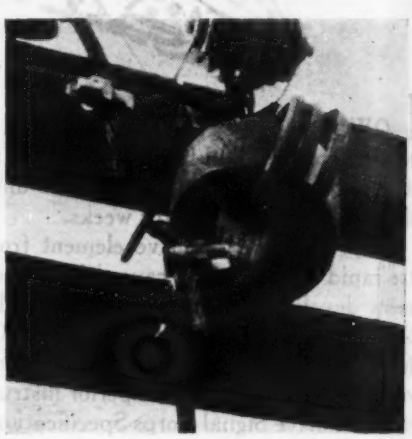


FIG. 4.—Reactor made from spiral core, supported by insulated spool

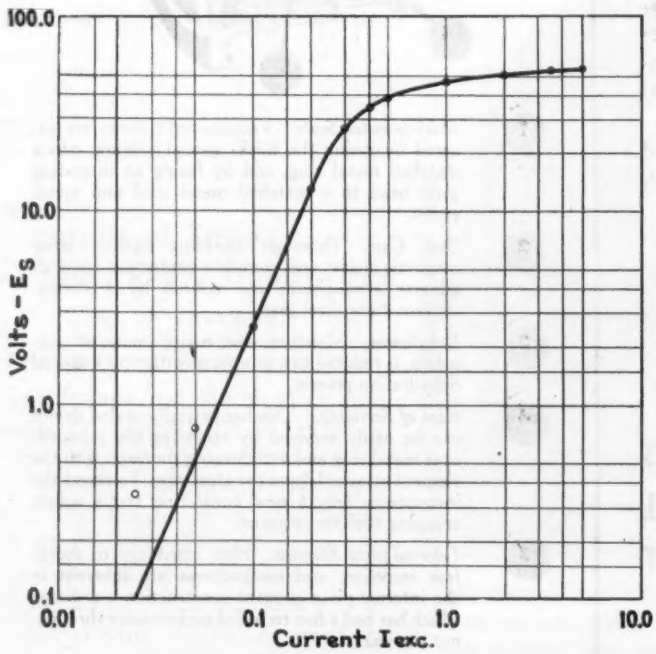


FIG. 2—Volt-ampere excitation characteristics of bushing current transformer with 40-turn secondaries

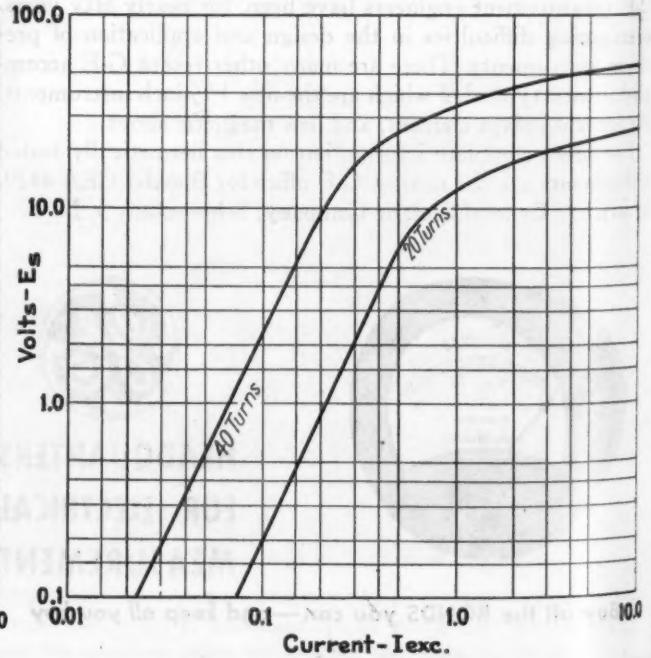
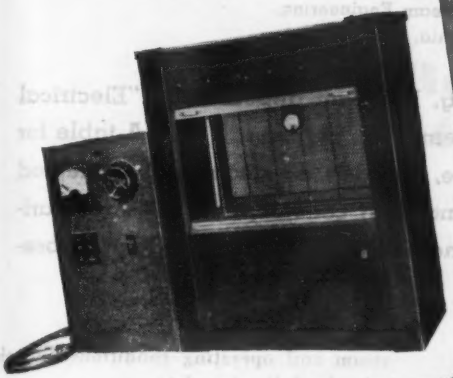


FIG. 3—Volt-ampere excitation characteristics of halved and reshaped cores for use in 15-kv. oil circuit breaker (FKO-60-B)

Some Time-saving Testers

GLOVE TESTER -- 20,000 VOLTS A-C



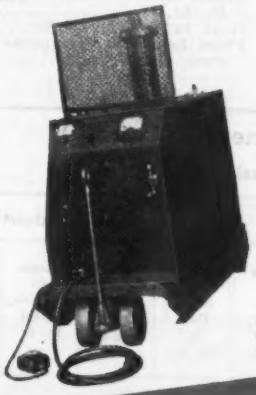
A QUICK, SAFE WAY TO TEST RUBBER GLOVES

This glove tester consists of two sections which fit together as a unit: a glove testing cabinet, and a high-voltage a-c power supply (which can be used separately, if desired, for general-purpose testing).

The glove-testing compartment, which contains a water tank in the lower section, is provided with supports for simultaneous testing of six standard linemen's rubber gloves. Contact with the water inside the gloves is made by chains hanging from a high-voltage bus which is solidly supported on insulators. A milliammeter connected in the high-voltage circuit indicates the leakage current in a glove when one of the six control buttons at the top of the cabinet is pushed.

This set, which operates on 115 volts, 60 cycles, fully meets all requirements of the National Safety Council for this class of testing. For complete information, write for HB-5112, page 101.

PORTABLE TEST SET -- 100,000 VOLTS A-C



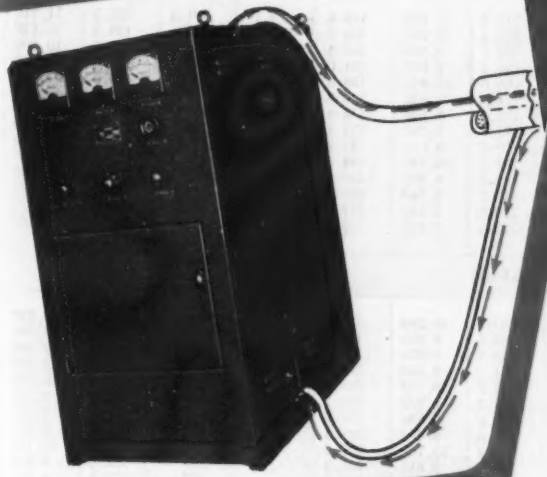
MAKES IT EASY TO TEST HARD-TO-MOVE EQUIPMENT

This completely self-contained, sturdy, a-c equipment has a rating of 10 kva, making it suitable for testing large, high-voltage equipment such as transformers, circuit breakers, bushings, and short lengths of cable.

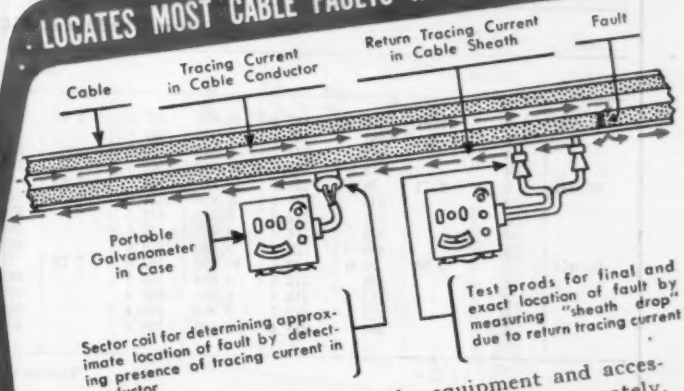
The voltmeter is highly accurate throughout the complete range up to 100,000 volts, at all loads and power factors, thus permitting precision measurements of the applied voltage.

Approximate dimensions are 5¾ by 2½ by 6 feet. Operates on 230 volts, 60 cycles. For safety, release of a floor switch, which must be held down during test, instantly de-energizes the set. For more information, ask for HB-5110, page 121.

D-C CABLE-FAULT SET



LOCATES MOST CABLE FAULTS IN LESS THAN 1 HOUR


Cable
Tracing Current in Cable Conductor
Return Tracing Current in Cable Sheath
Fault
Portable Galvanometer in Case
Sector coil for determining approximate location of fault by detecting presence of tracing current in conductor
Test prods for final and exact location of fault by measuring "sheath drop" due to return tracing current

This d-c set includes all the equipment and accessories required to locate faults quickly and accurately.

The set is used at the station, first to reduce fault resistance, then to transmit a d-c tracing current, which can be followed out along the cable with an exploring coil and galvanometer. Write for Bulletin GEA-3687B for complete data.

APPARATUS DEPT., GENERAL ELECTRIC COMPANY, SCHENECTADY 5, N. Y.

MAKE G.E. YOUR TESTING-EQUIPMENT HEADQUARTERS

GENERAL ELECTRIC

401-28-5155

BUY WAR BONDS

HOW TO DETERMINE STEAM REQUIREMENTS FOR TURBINE-GENERATOR UNITS

By F. K. FISHER and J. R. CARLSON, Central Station Steam Engineering, Westinghouse Electric Corp., South Philadelphia, Pa.

Accompanying table provides approximate steam consumption, at rated load, for turbine-generator units in capacities 15,000 kw. air-cooled, and 20,000 to 60,000 kw. hydrogen-cooled, and for initial steam 850 lb. gage, 900 deg. F. Similar tables for 400 lb. gage, 750 deg. F., and 600 lb. gage, 825 deg. F. steam appeared in "Electrical World", September 1, 1945, page 116. A table for 1,250 lb. gage, 950 deg. F. steam and a method for determining heat consumption rates for various steam conditions will be published in a subsequent issue.

Data obtainable from table:

Straight Condensing Operation—(1) Steam rate; (2) Steam flow to turbine; (3) Steam to condenser; (4) Heat rate.

Feed-water Heating Operation — (1) Steam flow to turbine; (2) Steam flow to condenser; (3) Final feed-water temperature; (4) Heat rate.

Example

Determine the performance of a 25,000-kw., hydrogen-cooled turbine-generator unit designed to operate with 850 lb. gage, 900 deg. F. steam, 1.5 in. Hg absolute exhaust pressure, and having four and three stages of feed-water heating.

Refer to the table for the respective steam and operating conditions and obtain the following data:

Item	4 stages	3 stages
Steam flow to turbine, lb./hr.	220,800	219,100
Steam flow to condenser, lb./hr.	164,500	166,700
Heat rate, Btu./kw.-hr.	9,640	9,740
Final feed-water temperature, deg. F.	388	370

Approximate Steam Consumption For Turbine-Generator Units

(At Rated Load and at Various Steam Conditions)

Rating, kw.	No. Stages Feed-Water Heating	1.0 in. Hg. Exhaust Pressure					1.5 in. Hg. Exhaust Pressure					2.0 in. Hg. Exhaust Pressure				
		Rated Load Steam Rate, lb./kw.-hr.	Final Feed-Water Temp., deg.F.	Steam to Turbine, 1,000 lb./hr.	Heat Rate, Btu./kw.-hr.	Steam to Condenser, 1,000 lb./hr.	Rated Load Steam Rate, lb./kw.-hr.	Final Feed-Water Temp., deg. F	Steam to Turbine, 1,000 lb./hr.	Heat Rate, Btu./kw.-hr.	Steam to Condenser, 1,000 lb./hr.	Rated Load Steam Rate, lb./kw.-hr.	Final Feed-Water Temp., deg.F.	Steam to Turbine, 1,000 lb./hr.	Heat Rate, Btu./kw.-hr.	Steam to Condenser, 1,000 lb./hr.
Steam Conditions: 850 lb. Gage, 900 deg. F.																
Single Casing Units																
15,000	0	7.81	79.0	117.2	10,980	117.2	7.96	91.7	119.4	11,090	119.4	8.10	101.1	121.5	11,210	121.5
	2		333	130.2	9,970	101.8		345	133.3	10,090	104.2		355	136.2	10,220	106.5
	3		357	131.3	9,840	99.9		370	134.5	9,960	102.4		379	137.5	10,090	104.6
	4		375	132.2	9,740	98.5		388	135.5	9,860	101.0		397	138.6	9,990	103.3
20,000	0	7.71	79.0	154.2	10,840	154.2	7.83	91.7	156.6	10,910	156.6	7.95	101.1	159.0	11,000	159.0
	2		333	171.3	9,850	134.0		346	174.9	9,930	136.8		355	178.2	10,030	139.4
	3		357	172.8	9,710	131.5		370	176.4	9,800	134.3		379	180	9,900	137.0
	4		375	174.0	9,620	129.6		388	177.7	9,700	132.4		397	181.4	9,810	135.2
	5		389	175.4	9,560	128.4		402	179.2	9,650	131.2		411	183.0	9,750	134.0
25,000	0	7.68	79.0	192.0	10,800	192.0	7.78	91.7	194.5	10,840	194.5	7.89	101.1	197.3	10,920	197.3
	2		333	213.3	9,810	166.8		346	217.2	9,870	169.9		355	221.1	9,960	172.9
	3		357	215.2	9,680	163.8		370	219.1	9,740	166.7		379	223.2	9,830	169.9
	4		375	216.7	9,580	161.4		388	220.8	9,640	164.5		397	225.1	9,730	167.7
	5		389	218.4	9,520	159.9		402	222.6	9,580	162.9		411	227.0	9,680	166.1
Tandem Compound Units																
30,000	0	7.61	79.0	228.3	10,700	228.3	7.71	91.7	231.3	10,740	231.3	7.82	101.1	234.6	10,820	234.6
	3		357	255.9	9,590	194.7		370	260.6	9,650	198.3		379	265.5	9,740	202.0
	4		375	257.7	9,490	192.0		388	262.6	9,550	195.6		397	267.7	9,650	199.4
	5		389	259.7	9,430	190.1		402	264.7	9,500	193.8		411	269.9	9,590	197.6
35,000	0	7.59	79.0	265.7	10,670	265.7	7.69	91.7	269.2	10,720	269.2	7.80	101.1	273.0	10,800	273.0
	3		357	297.7	9,560	226.5		370	303.2	9,620	230.7		379	309.0	9,720	235.1
	4		375	299.8	9,470	223.4		388	305.6	9,530	227.7		397	311.5	9,620	232.1
	5		389	302.2	9,410	221.2		402	308.0	9,470	225.5		411	314.1	9,570	230.0
40,000	0	7.58	79.0	303.2	10,660	303.2	7.68	91.7	307.2	10,700	307.2	7.79	101.1	311.6	10,780	311.6
	3		357	339.8	9,550	258.6		370	346.1	9,610	263.3		379	352.6	9,700	268.4
	4		375	342.2	9,450	254.9		388	348.7	9,510	259.8		397	355.5	9,610	264.8
	5		389	344.8	9,400	252.4		402	351.5	9,460	257.3		411	358.5	9,560	262.4
50,000	0	7.57	79.0	378.5	10,640	378.5	7.67	91.7	383.5	10,690	383.5	7.78	101.1	389.0	10,770	389.0
	3		357	424.2	9,540	322.8		370	432.0	9,600	328.8		379	440.3	9,690	332.1
	4		375	427.2	9,440	318.3		388	435.4	9,500	324.4		397	443.9	9,600	330.7
	5		389	430.5	9,390	315.1		402	438.9	9,450	321.3		411	447.7	9,540	327.7
60,000	0	7.56	79.0	453.6	10,630	453.6	7.66	91.7	459.6	10,670	459.6	7.77	101.1	466.2	10,750	466.2
	3		357	508.4	9,520	386.9		370	517.7	9,580	394.0		379	527.7	9,680	401.6
	4		375	512.0	9,430	381.4		388	521.7	9,490	388.7		397	531.9	9,590	396.3
	5		389	515.9	9,370	377.6		402	526.0	9,440	385.0		411	536.5	9,530	392.7

Meet SEYMOUR!

He's Ready Now to Help You Sell Better Commercial Lighting

Seymour (See-More) is the sprightly hero of the General Electric Lamp Department's new full-color talking movie, called "SEEING IS THE BIGGEST THING IN SELLING."

Every store-lighting prospect in your territory ought to see and hear the lively, persuasive Seymour dramatize what modern lighting can do to increase retail profits. Use him to show your commercial customers that SEEING IS THE BIGGEST THING IN SELLING and that LIGHTING IS THE BIGGEST THING IN SEEING.

Eight out of ten stores are ready and eager to improve their lighting and, with the aid of new light sources developed by General Electric Lamp Research, the lighting industry can give them better lighting than ever before.

"SEEING IS THE BIGGEST THING IN SELLING" includes a lot more than the motion picture in which Seymour plays the leading role. It's a well-rounded, fast-and-firm promotion and sales program, developed by G-E Lamps, to bring together all branches of the lighting industry in a unified drive for the fullest development of the commercial market.

Your General Electric Lamp Representative can give you the full details. For example, the program includes:

3

Sales Training. The new G-E training program for lighting salesmen, prepared in cooperation with the famous LaSalle Extension University, makes full use of modern educational techniques to give your salesmen a sound knowledge of lighting and salesmanship. It's adaptable both to individual and group instruction. The commercial lighting course includes five texts, examinations and a personal consultation service. Even experienced lighting salesmen will find it worthwhile.

1

Sales Aids. G-E's compact new Visualizer sets up right on the merchant's desk or counter to help the salesman demonstrate exactly what lighting can do. It's one of the most useful sales aids G-E has ever offered! Along with it, G-E has prepared a booklet to leave with the merchant and a recommendation form to help close the sale!

Don't Delay! Ask Your G-E Lamp Representative for Complete Information about SEEING IS THE BIGGEST THING IN SELLING.

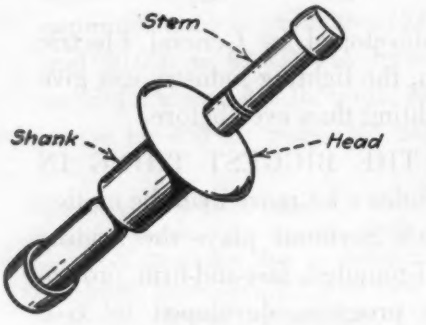
GENERAL ELECTRIC

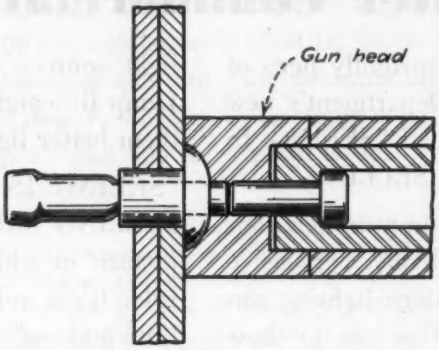
RIVETS AS PERMANENT FASTENING DEVICES

Rivets depend on deformation of part of their structure to provide holding power. They are driven either hot or cold. In general, rivets are stronger than threaded fasteners and, on a first-cost basis they are usually more economical.

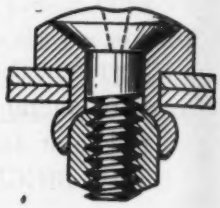
Inspection of a job includes tightness of rivets, contact of heads with sheet, damage to sheet, distortion or cracking of rivet heads. Standard rivets have comparatively untapered shanks and approximately 20 head shapes ranging from ball type, through round and cone types, to countersunk and brake-band types.

Various special rivets are available for use particularly in blind applications. Some of these are illustrated and explained in the accompanying sketches.



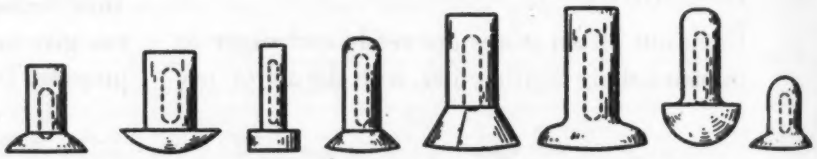


CHERRY—Available in self-plugging or tubular types. Installed by placing shank in hole and pulling stem with special tool to form tulip head on blind side. Self-plugging and tubular types are available

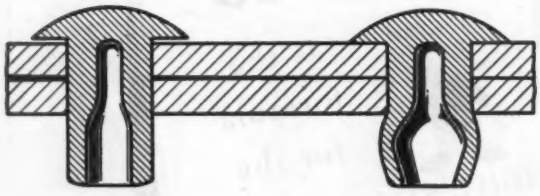


PRECO — Consists of steel bolt inserted in hollow stem of high-strength aluminum-alloy rivet and dural nut on bolt. Rivet expands when nut is drawn into it by turning bolt with screwdriver

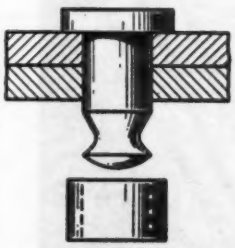
DAVIS — Consists of threaded shank inserted in sleeve and held together with nut with sloping faces. Standard Phillips screwdriver, with special sleeve to keep fastener sleeve from turning, draws sloping faces of nut against far end of slotted sleeve and expanding sections against back of work



PLASTIC—Made of thermoplastic materials with hollow center, closed on end that expands into bubble shape when special gun is used. For non-stress applications such as fastening fabric to metal, wood or plastic sheets

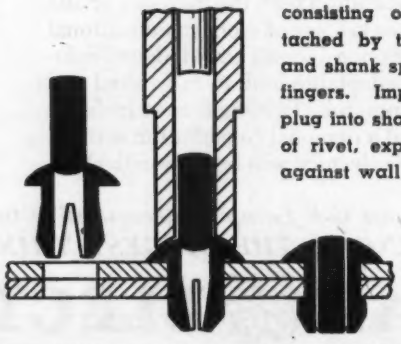


EXPLOSIVE—Charge in shank cavity is detonated with electric gun, expanding charged end of shank and forming head on blind side



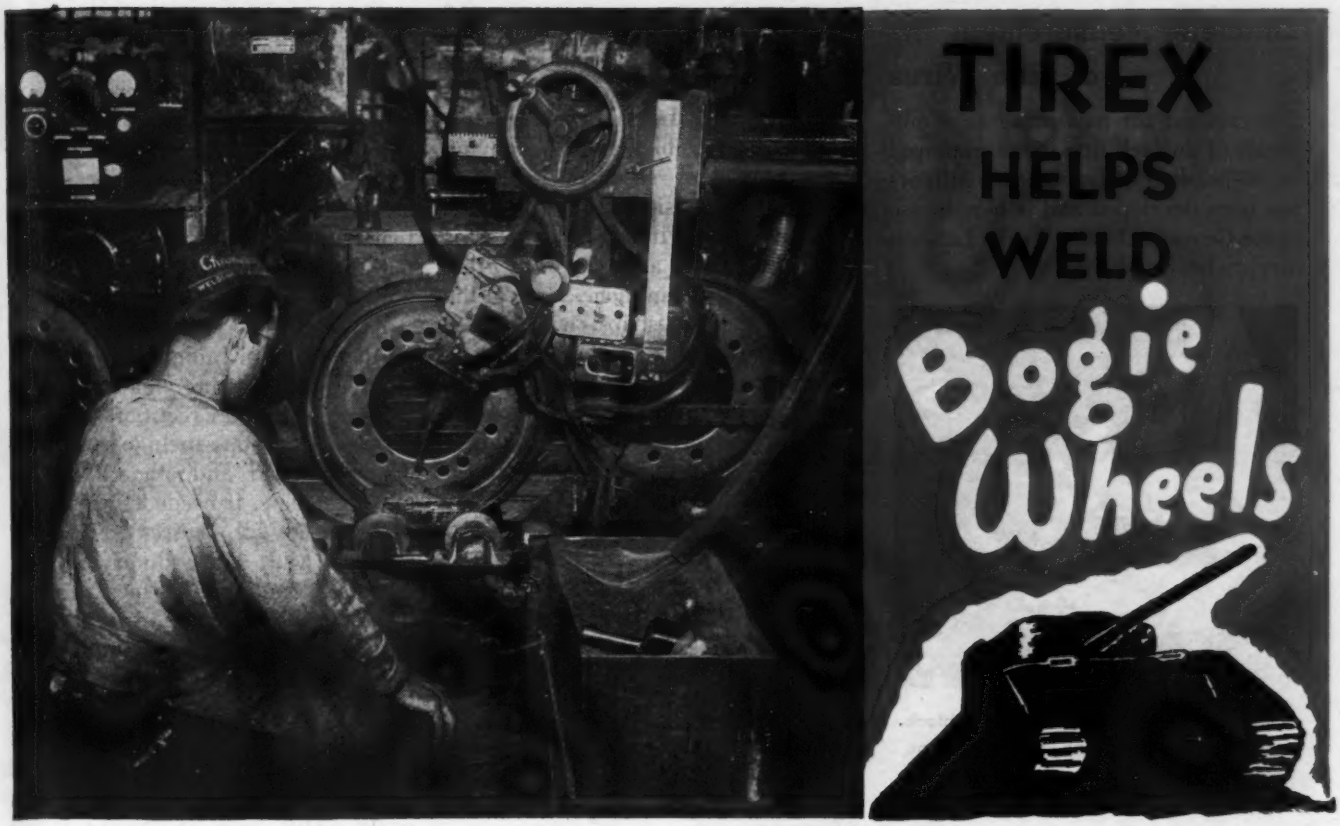
HI-SHEAR—Aluminum-alloy collar is squeezed over alloy steel pin, trimmed with special tool

RIVNUTS — Provided with threaded core. First screwed on pull-up stud of special heading tool, then pushed into hole and upset by retracting tool. Pull-up stud is then unscrewed, leaving core of Rivnut available as nut plate



DES-RIVET—One-piece plastic rivet consisting of head with plug attached by thin breakaway section and shank split to form four tapered fingers. Impact from gun drives plug into shank flush with both ends of rivet, expanding tapered fingers against wall of drilled hole

Courtesy American Machinist



Here is one of the many interesting jobs that Simplex - TIREX has been doing during the war to help get "too much—too soon" to our boys overseas.

Illustrated is a machine for welding bogie wheels for tanks. It was standard practice to rivet these wheels but it was found that they could be made better, cheaper and faster by welding.

Of course TIREX cables were used as can be seen from the picture because TIREX has the tough Selenium Rubber Armor and too, because TIREX Welding cables are extremely flexible they won't lay down on the job. They're tough and they will give dependable service over a long period of time.

Specify TIREX Welding cables the next time you are in the market.

Simplex Wire & Cable Co., 79 Sidney Street, Cambridge 39, Mass.

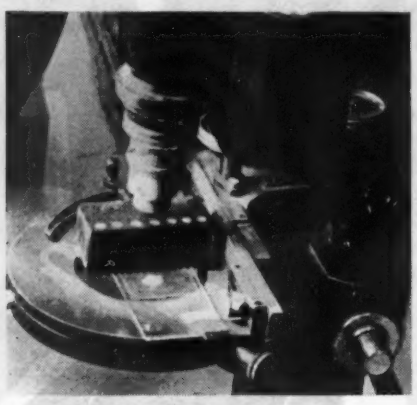
ARMY E NAVY

Simplex

WIRES and CABLES

Diameter Measurement of Fine Wires

A method for measuring to a millionth of an inch fine wires employed in suspending galvanometer mirrors has been developed and is now in use at the General Electric Works Laboratory, Schenectady, N. Y.



EXPOSED WIRES in plastic block are examined through a miscroscope equipped with a micrometer for measurement of the wire diameter

The mirrors are attached to a small coil which rotates in response to minute currents flowing through a larger fixed coil around it. The suspension wire is twisted, and its diameter must be maintained with great accuracy if the instrument is to operate with the desired precision. Measurements to a ten-thousandth of an inch, which can be made with a good micrometer, are not accurate enough.

Developed by E. D. Reilly, of the G-E Works laboratory, the mew method consists in molding, under heat and pressure, a plastic block with a series of V-shaped grooves in its upper surface. By limiting the amount of heat, the block is only partly "cured," otherwise the additional plastic which is later applied to it would not stick. Into these grooves short pieces of the wires are placed. Then the block is returned to the molding press, a very fine molding powder is poured over the wires and a somewhat coarser powder is put on top. Again pressure and heat are applied, until the whole block is hard.

The very fine powder works around the wires and grips them firmly, so that the block can be sawed across the wires without distorting them. If they were sawed or cut without being imbedded in the plastic they would be badly mashed.

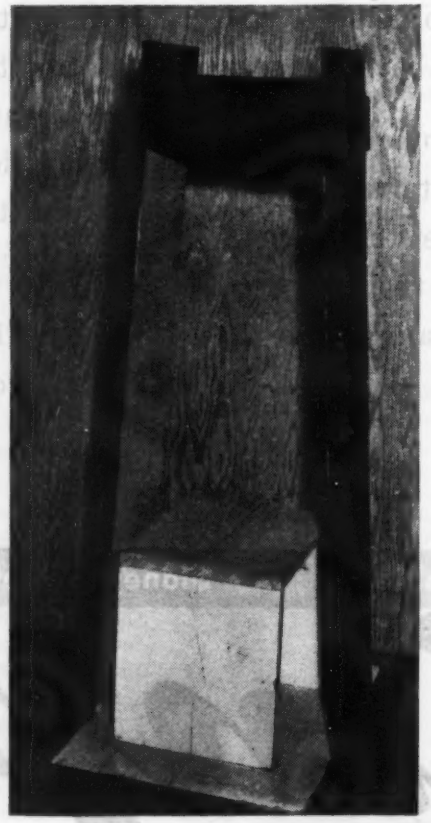
The face of the block, which exposes the cross section of the wire, is then carefully polished and examined under a microscope with a micrometer eyepiece. In the eyepiece two threads are visible, and by moving them until they seem to touch diametrically opposite parts of the cross section of the wire, the diameter is determined, with a precision as great as a millionth of an inch. Some of the wires are really strips, with a rectangular cross section. The method is especially applicable to these for even with a sufficiently accurate micrometer caliber of the usual type it would be difficult to place the strip properly between its jaws.

•

Nameplate Photos Stop Arguments

Horse racing, politics and what's on the nameplates of system apparatus are sure-fire sources of argument except in the Northern Indiana Public Service Co., Hammond. Here disagreements over name plate data are quickly resolved by reference to photographic records of nameplates kept for just such occasions.

On this system all generator, primemover, synchronous converter and rectifier nameplates have been recorded on official photographs which also bear the unit number and location. In locations, such as generating stations, where a group of units operate as a unit the nameplates of related machines are photographed together along with the legend designating the unit number and station name.



STAND USED in photographing nameplates. Camera is placed on frame at top, nameplate is placed below

At present the photographic record on the Northern Indiana system is restricted to rotating machines and mercury-arc power rectifiers. The list may be extended to include transformers, switchgear and other apparatus at a later date, if needed.

Practically all pictures are taken in sunlight with an ordinary folding camera mounted in a special stand. Nameplates are removed from the machines and placed on the stand in the field of the camera. The camera used happens to have a double lens and double extension bellows making it possible to remove one lens element and take closeup pictures advantageously. This type of camera is not essential, however.

•

Drying Transformers*

II—With Oil Removed

W. C. SEALEY
Engineer In Charge of Design
Transformer Section
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Recommendations for drying transformer cores and coils under oil in the transformer tank by short circuiting the windings and applying a partial load, were discussed in the first article of this series. The other general method is to remove the core and coil assembly from the oil and dry it either inside or outside the tank by applying (1) internal heat (2) external heat or (3) a combination of the two.

(1) *Internal Heat Method*—Alternating current is used for this method. The core and coil assembly is left in the tank after the oil is removed but the tank cover is left off. One of the windings can be short circuited and sufficient voltage impressed across the other winding to circulate enough current in the windings to maintain 75 to 80 deg. C. About one-fifth of normal full rated current is generally enough. Voltage necessary to circulate this current

* Part II of a three-part series.

Power Conversion at its BEST

for Economical, Efficient
Power Conversion A-C to D-C

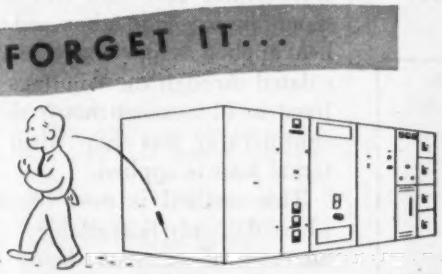
75 to 500 Kw—250-volt Class
100 to 1000 Kw—600-volt Class
or
Special Voltage Applications

The Westinghouse Sealed Tube Ignitron Unit Substation combines efficient, dependable power conversion equipment in a completely metal enclosed compact unit. The Ignitron Tubes, permanently evacuated and sealed at the factory, eliminate the need for vacuum maintaining equipment . . . thereby reducing maintenance to a minimum.

The lighter, more compact, dry-type ASL Transformer removes the disadvantages of liquid filled equipment and eliminates fire hazard completely.

The Westinghouse 1946 model Ignitron Unit Substation, employing the ASL Transformer, requires less floor space per kw than *any* other conversion equipment. Completely assembled at the factory, it provides easy installation and makes future relocation a simple operation.

CONSULT WESTINGHOUSE—Call your nearest Westinghouse office or write for B-3646—"POWER CONVERSION AT ITS BEST"—Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-10298



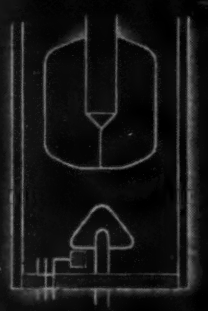
These Westinghouse Unit Substations can operate unattended, with practically no maintenance. Operation is quiet—there is no vibration. High load swings are readily handled. Momentary overloads, or even short circuits cause no damage.

. . . AS IN THE PREVIOUS 15 YEARS

CONSIDER ALL THE ADVANTAGES OF THIS IDEAL POWER UNIT

- Factory assembled
- High efficiency
- Requires NO special foundation
- Easy to install or relocate
- No special air cooling requirements
- Quiet operation...No vibration
- No starting inrush
- Low maintenance
- Instant power upon demand
- Any load demand any time, or full time

THE WESTINGHOUSE IGNITRON PRINCIPLE



provides a reliable method of starting an arc in a few microseconds, at the beginning of each conducting period and permits the arc to extinguish when the anode is not conducting current.

Each anode, with its own cathode, is mounted in a separate chamber; shields are reduced to a minimum, thereby lowering arc losses.

Electronics at Work

IN this land of many waters, SMITHway engineers devoted 23,000 test-years to the perfection of the *Permaglas* formula. Regardless of the type of water encountered...soft waters of the mountains, hard waters of the plains, acid waters of the bayous, iron-laden waters of the ore regions, or any of the other waters harmful to most water heaters...*Permaglas* "plays no favorites." It resists the attacks of even the most destructive of waters.

No trace of rust or corrosion can originate inside a SMITHway *Permaglas* tank. Hot water as pure as the original water supply itself is *always* assured.

There is only one *Permaglas*... the sparkling blue, mirror-smooth, glass-fused-to-steel that makes SMITHway *Permaglas* Electric Automatic Storage Water Heaters easiest to sell, and most satisfactory in use.

Write for "The Inside Story of *Permaglas*"... a great aid to sales!

HOT WATER BY wire

A. O. SMITH Corporation

A. O. Smith Corporation, Dept. EW945 H.
Please send me a copy of "The Inside Story of *Permaglas*."

Name.....

Title.....

Company Name.....

City and State.....

SMITHway Permaglas GLASS-FUSED-TO-STEEL ELECTRIC WATER HEATERS

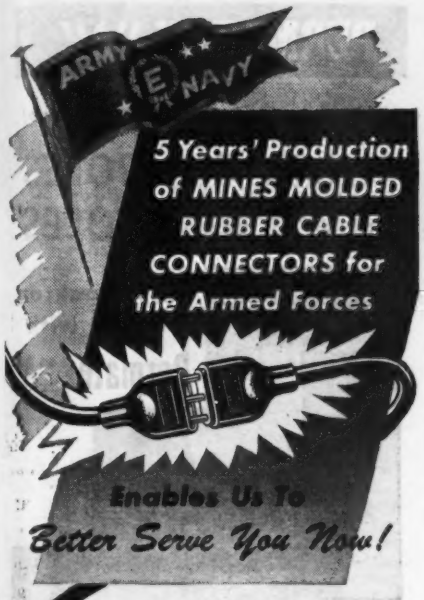
varies for different transformers but is generally one to two percent of normal voltage. End terminals must be used—not taps so current will flow through the entire winding. This method is superficial and slow and should be used only with small transformers when conditions will not permit use of another method.

(2) *External Heat*—The transformer assembly should be placed in a box with holes in the top and near the bottom for air circulation. Clearances between box and transformer should be small so that most of the heated air will pass through the ventilating ducts among the coils and not around the sides. Best way to obtain the heat is from resistance units. Temperature limit of air going into the enclosure is 90 deg. C. Cores and coils must be carefully protected from direct radiation from the heaters. No inflammable material should be allowed near the heaters and the enclosure could well be lined with asbestos. When forced air is used, suitable baffles should be placed between the heater and inlet to the enclosure.

The heater may well be placed outside the enclosure and heat carried into the bottom of the box through a suitable pipe. Where this plan is followed, heat may be generated by combustion of gas, coal or wood, provided products of combustion are excluded from the box. However it is not advocated except where electric power is not available.

(3) *Combination of Internal and External Heat*—This is a combination of methods (1) and (2). The transformer core and coil assembly should be placed in a box and external heat applied as above, and current circulated through the windings as outlined in (1) except that it should be considerably less than when no external heat is applied.

This method is used occasionally where d.c. only is available; a certain amount of current being passed through the high voltage winding only, as the cross sectional area of the low-voltage conductor is generally too large for the transformer unit to be heated with reasonable amount of direct current. The use of direct current for drying out is not recommended except where a.c. cannot be obtained. When this method is used temperature should be measured by the increase in resistance method. Method (3) is quicker than either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NAVY
5 Years' Production of MINES MOLDED RUBBER CABLE CONNECTORS for the Armed Forces
Enables Us To Better Serve You Now!

The tough usage of war has demonstrated the adaptability of Mines Molded Rubber Cable Connectors in Army and Navy use. Millions of these rugged connectors have been used all over the world — on Land and Sea.

Many types and sizes of Mines Connectors have been supplied in the war-time production drive for efficiency. Among them were Single Conductor and Multi-Conductor for all types of application — low amperage for electronic detectors and measuring instruments, naval shore installations and forces afloat, air force ground equipment and aircraft components, telephone and radio communication equipment.

Practically every branch of our fighting forces has been aided in its efficiency by Mines Connectors.

In recognition of a job well done, the men and women of the Mines Equipment Company have *four times* been awarded the Army-Navy "E" for their great production record.

The same skill and efficiency in meeting requirements for safe, efficient, portable power supply is again becoming available to private industry. The same quality of product and workmanship can again be offered to you.

Let our experienced engineers work with you in solving your portable power supply problems,

Write for Bulletin MC-106 and General Connector Catalog.

MINES EQUIPMENT COMPANY

4235 Clayton Avenue
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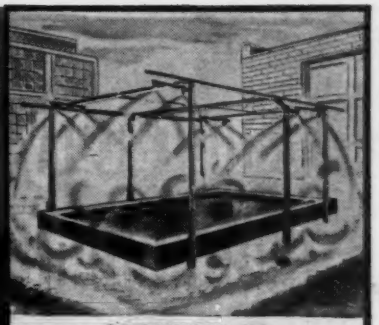
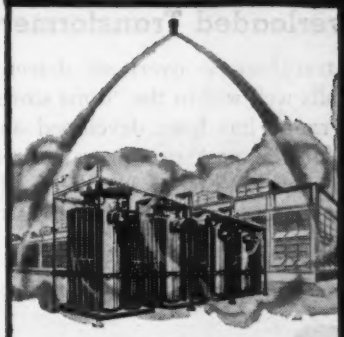
How Do We KNOW that

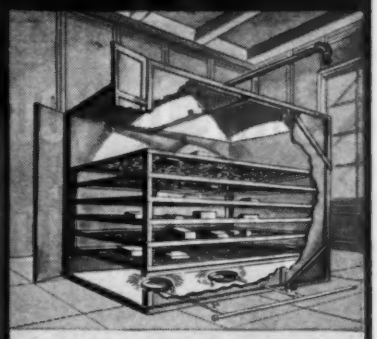


OPEN TANKS OF FLAMMABLE LIQUID



TRANSFORMERS

"AUTOMATIC" FIRE-FOG Quenches Really Tough Fires?



DRYERS AND OVENS

That's simple — we put FIRE-FOG to the test.

Here's what we do:

In our Test Yard at Youngstown we recreate actual conditions. If it's a question of extinguishing a quench tank fire, say, or a blazing transformer, we "set the stage" for the fire, exactly duplicating conditions where such fire hazards exist.

Then we know, almost to a second, how long it takes FIRE-FOG to quench fire; the most effective type and arrangement of FIRE-FOG nozzles; the amount of water used, etc.

Thus we eliminate guess-work. And what soul-satisfying comfort there is in the thought that FIRE-FOG is *automatic* in operation—an alert fire guard on duty 24 hours out of every day.

FIRE-FOG stops fires in Mixers, Coaters, Ovens, Dryers, Dip Tanks and flammable liquid processing, handling and storage facilities.

"Automatic" Sprinkler

"AUTOMATIC" SPRINKLER CORPORATION OF AMERICA

YOUNGSTOWN, OHIO . . . . . OFFICES IN 38 CITIES

"Automatic" Sprinkler manufactures and installs a complete line of fire protection devices and systems for all types of fire hazards. Listed by Underwriters' Laboratories and approved by Factory Mutual Laboratories.

Laboratory Equipment

Built to your specification

OTHER PRODUCTS

- Single phase enclosures
- Polyphase enclosures
- Test tables
- Safety blocks
- Transformer enclosures
- Reactiformers
- Accessories

If it bears the Superior name it's a SUPERIOR product.

SUPERIOR
SWITCHBOARD & DEVICES CO.
CANTON, OHIO

(1) or (2) and has the great advantage that the insulation is heated much more uniformly.

There is no definite length of time for drying. One to three weeks is generally required, depending upon the condition of the transformer, the size, voltage and method of drying used.

•

Temperature Cells Spot Overloaded Transformers

A transformer overload detector that falls well within the "dime store" price range has been developed and used for the past two years on the Public Service Co. of Northern Illinois system to spot overloaded distribution transformers.

THREE TEMPERATURE CELLS that each change color at a different temperature will indicate when this transformer has reached or exceeded safe operating loads. Cells are paper backed, mounted on a weatherproof adhesive assembly and cost about a dime

This device, which was developed and perfected by Messrs. E. L. Tornquist, G. L. Paldani and W. S. Guyot, consists simply of a series of paper-backed temperature cells each operating at a different temperature and mounted in a weatherproof adhesive assembly that can be applied to the transformer case like a court plaster.

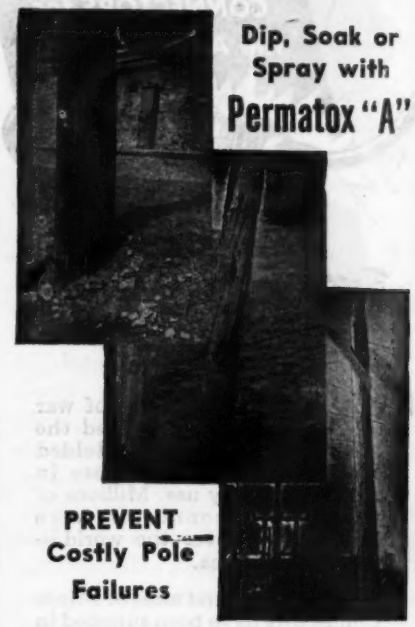
Each temperature cell — Public Service usually applies three to a transformer as shown—is designed to operate at a different temperature; revealing a colored spot when its "critical" temperature has been exceeded.

Secret of the operation of these cells is quite simple. Each is made up to a substance that melts at a specific temperature and dissolves a dye;

PERMATOX "A"

(A Straight Toxic Wood Preservative)

Reclaim OLD POLES
Preserve NEW POLES



Dip, Soak or Spray with Permatox "A"

PREVENT Costly Pole Failures

With the pole shortage becoming more critical, it is vitally necessary to get the utmost service from every pole now in stock or installed on your lines.

PERMATOX "A" (5% pentachlorphenol in suitable petroleum solvents) affords an effective, economical preservative treatment . . for the control of decay, shell-rot and termite attack.

Specify it for poles, posts, crossarms, ties, crossing planks, bridge timbers and other exposed construction. Soaking or pressure treatment insure adequate absorptions and deep penetration.

Furnished in Two Forms:—

DOWICIDE 7
Pentachlorphenol* crystals

PERMATOX "A"
5% Pentachlorphenol* in suitable petroleum solvents
* Manufactured by The Dow Chemical Company

Write for Bulletin—Dept. E.

A. D. CHAPMAN & COMPANY, INC.

333 N. Michigan Ave., Dept. "E"
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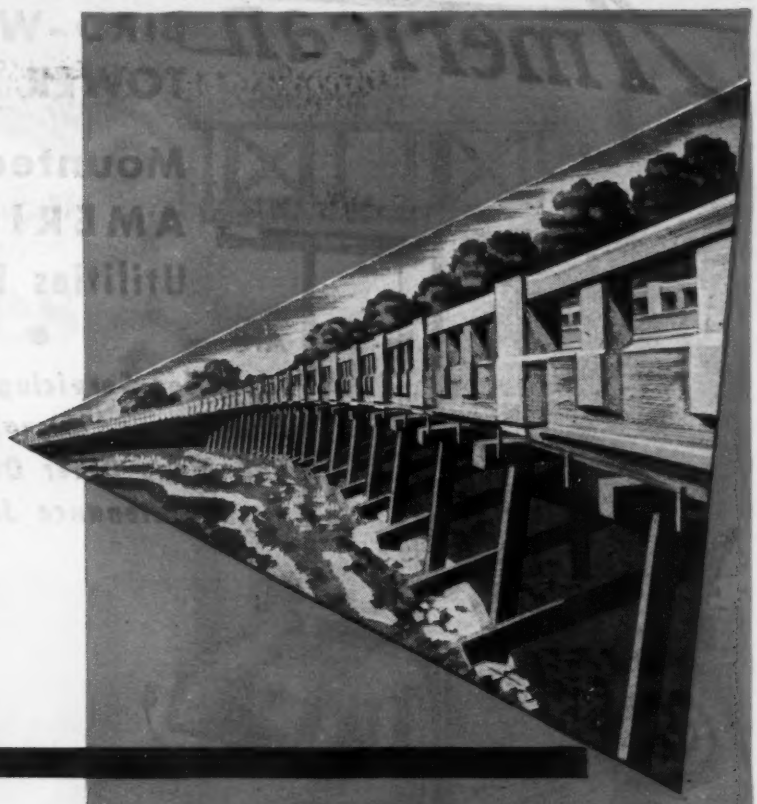
ONE OF THE MANY DOW CHEMICALS USED BY AMERICAN INDUSTRY

50,000,000,000 termites can be wrong!



Fifty billion termites on the loose . . . a real menace to the lumber industry! There are at least that many of these pests throughout the nation, looking for a meal from anything that's made of wood.

Preserving wood from termites and fungi looked like another job for Dowicide. Dow technicians tackled the problem . . . submitted their findings to the lumber industry. In actual practice, it was found that Dowicide-treated lumber resisted termites, rot, and mold for unusually long periods of time . . . stayed clean, was easily handled, non-bleeding, paintable.

Today there's a longer life in store for many wood products—thanks to Dowicide. The range of Dowicide treatments now available offers simple, economical protection of wood from freshly cut logs to finished product.

Not only in the lumber industry, but in many another major field as well . . . paper, paints, leather, textiles . . . Dowicides are providing efficient protection against mold and decay. Bring *your* preservative problem to Dow! We'll be glad to help work out the Dowicide defense that's best for you.

THE DOW CHEMICAL COMPANY

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New York • Boston • Philadelphia • Washington • Cleveland • Detroit
Chicago • St. Louis • Houston • San Francisco • Los Angeles • Seattle

Dowicide

Germicides and fungicides

DOW

CHEMICALS

INDISPENSABLE TO INDUSTRY

American BIRD-WHITE TOWER LIFTS

Mounted On AMERICAN Utilities Bodies

Are—

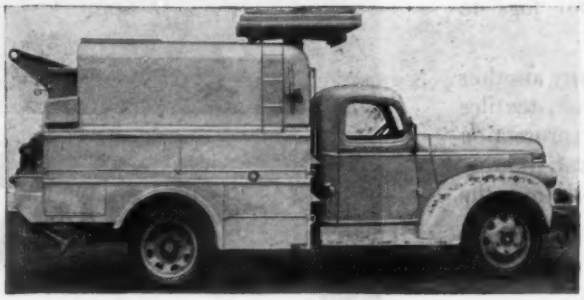
Ideal for Servicing Street Highway and Signal Lights and Many Other Overhead Maintenance Jobs

THE American-Bird-White Tower Lift equipment is designed and constructed to save time and expense in the performance of innumerable overhead jobs.

Light and compact yet ruggedly constructed and finely engineered, it can be easily spotted and operated in city streets or on country highways, always assuring workers real safety, comfort and convenience.

Some of the many important features that have given this equipment deserved approval by many utilities are:—

- Simplicity of Design and Construction.
- Unsurpassed Rigid Stability with the entire elimination of all side sway assured through specially designed Jacks.



THE American COACH & BODY CO.

PUBLIC UTILITIES EQUIPMENT FOR MOTOR VEHICLES

the dye in turn stains a piece of absorbent paper leaving a visual indication.

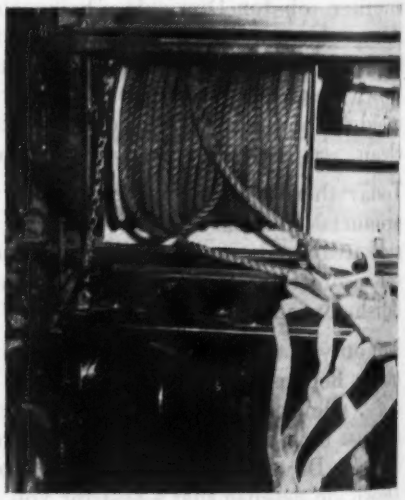
These overload detectors are applied to transformers in the field and inspected periodically for changes in color of the telltale spots that would indicate that the limit of safe operating temperature was being approached or had been exceeded. Thus, by selecting three different temperature cells it is possible to determine whether a transformer has attained a temperature that is in the upper or lower half of a specific range, or if the upper limit of the range has been exceeded.

Seven temperature cells have been developed covering the range from 40 deg. C. to 100 deg. C. in approximately 10 deg. steps. Specifically, these cells operate at 42, 52, 62, 70, 80, 94 and 105 deg. C. with a reported accuracy of plus or minus one degree.

•

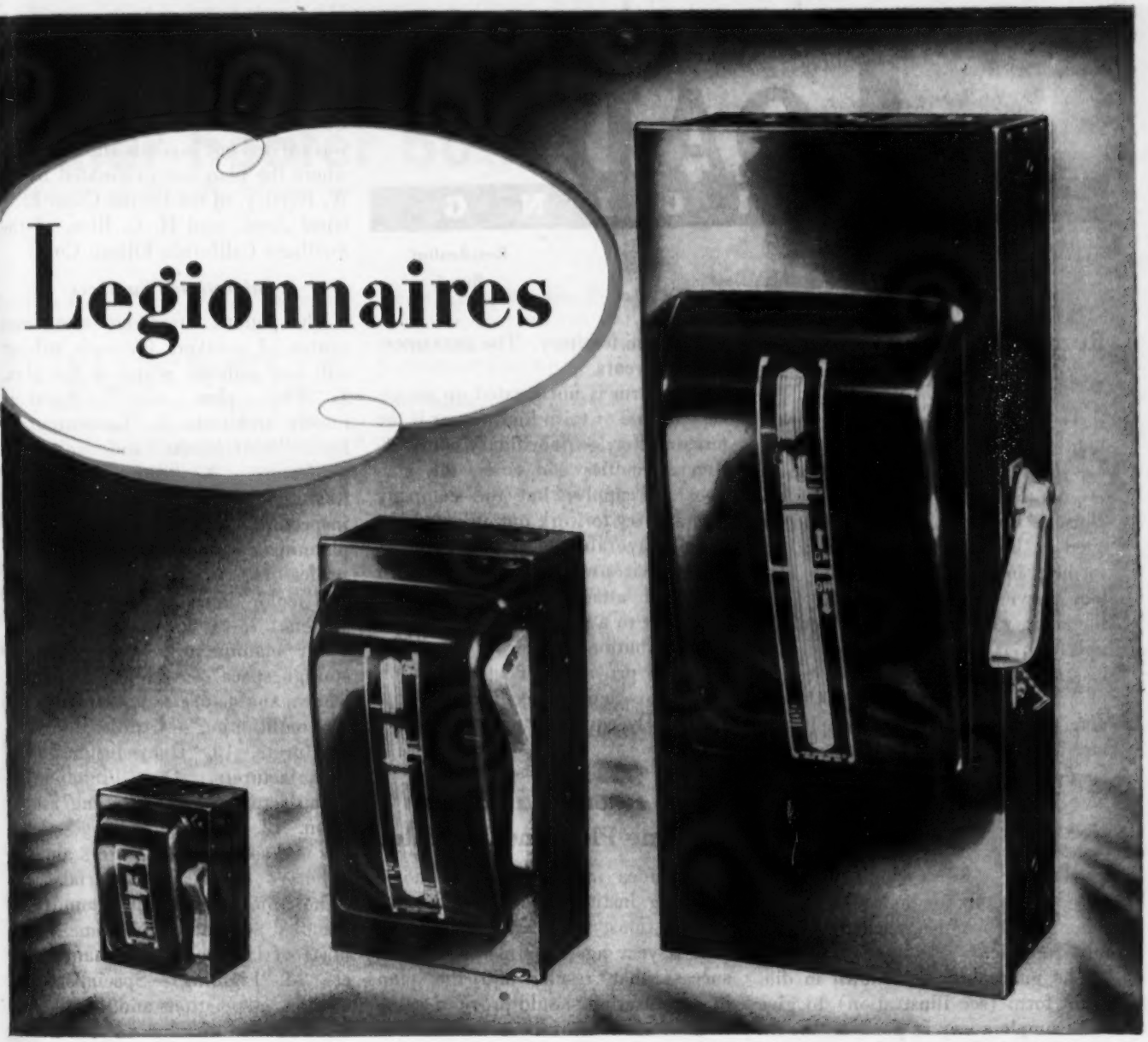
You Need A Life Line when You Need It

When accidents occur there is no time to waste looking for or untangling a lifeline. Realizing this Wisconsin Gas & Electric Co., has provided 150 ft. of ½-in. rope on a free-running reel in a special compartment on all its line trucks. Since this rope is *never* used for any other purpose than rescue work it is always available and in good condition when needed. A body belt is provided for use with the rope in lowering men from poles if needed. Line, reel and body belt on a typical truck are shown.



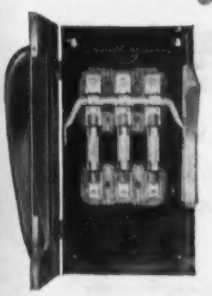
LIFE LINE provided on line truck exclusively for rescue work

Legionnaires



Vacu-Break SAFETY SWITCH with "CLAMPMATIC" CONTACTS

Sizes for Every Switch Job



For greater safety and dependability, longer life and lower upkeep costs, leading plants the country over depend on BullDog Vacu-Break Safety Switches.

Designed in a wide variety of sizes and types with capacities ranging from 30 to 1200 amperes, standard models of this famous switch are available for every industrial requirement.

No other safety switch has "Clampmatic" contacts, tight as a bolted connection in the ON position, to reduce heating—the Vacu-Break principle of arc suffocation to snuff out destructive arcs as quickly as they form—new simplified operating mechanism in modern streamlined cabinet.

Talk to expert BullDog field engineers about the electrical distribution problems in your plant. Or write us for literature.

BUY WAR BONDS

SALVAGE PAPER

BULLDOG

ELECTRIC PRODUCTS COMPANY

BOX 177, R. PK. ANNEX, DETROIT 32, MICHIGAN. BullDog Electric Products of Canada, Ltd., Toronto. Field Offices in All Principal Cities.

Also Manufacturers of

SafToFuse Panelboards—Switchboards—Circuit Master Breakers—Universal Trol-E-Duct, for flexible lighting—Industrial Trol-E-Duct, for movable "loads"—BUS-tribution DUCT, for "Plug-In" Power.

LOAD SERVICING

Commercial
Industrial

Residential
Rural

Rural Extensions Portrayed Graphically

To clarify a recently announced plan by which rural line extensions are to be made when WPB approval is obtained, the Western Massachusetts Electric Co., Springfield, issued a booklet for the benefit of farmers interested in obtaining electric service. As previously mentioned in press releases, the individual farm is required to pay for at least $2 worth of electric service per month, figured at the company's regular rate. This guarantee applies to any farm which can be reached by a single-phase line extension of not more than ½ mile; to a group of three or more customers (regardless of the distance between them) who can be reached by a 1-mile single-phase extension; by six or more farm customers who can be reached by a 2-mile run, etc.

The guarantees are shown in diagram form (see illustration) to give in as simple a way as possible, the essentials of the new rate, the company's goal being 100 percent electrification of its farm territory. The guarantees last five years.

If a farm is not located on an accepted state or town highway or if the terrain offers extraordinary construction difficulties and costs, the plan does not apply; but the company offers to try to work out an extension on as favorable terms as possible. Service wires will be run to a selected point of attachment on the farm house, or to a preferred central point of distribution, up to 150 ft. The program provides for the operation of motors not exceeding 7.5 hp. if properly equipped with starters.

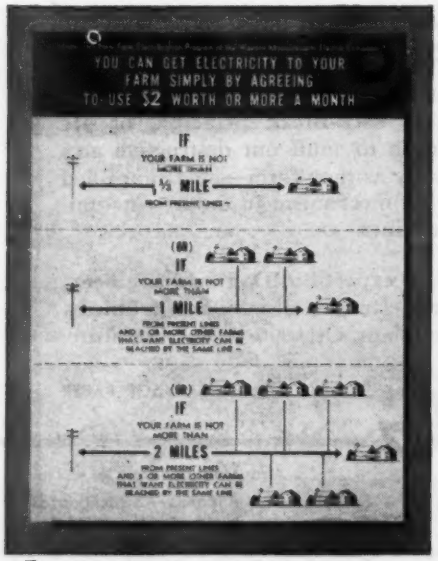
•

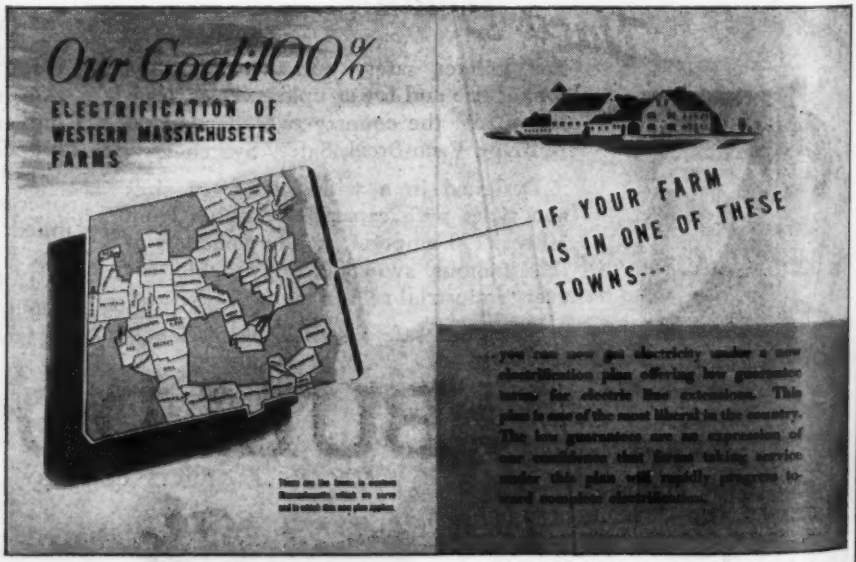
76,000 Attend California's Home Planning Institutes

The idea of conducting a home planning institute, developed by the Pacific Coast Electrical Assn. more than a year ago, has met with such success that results and the plan of organization should prove of value to other sections of the country. Since the idea was to give home planners information on every phase of building a home, considerable initial organizational work was required to secure the cooperation and participation of the interested industries. This was carried out in southern California where the plan was originated by V. W. Hartley, of the Pacific Coast Electrical Assn., and H. C. Rice, of the Southern California Edison Co.

Subjects and Speakers

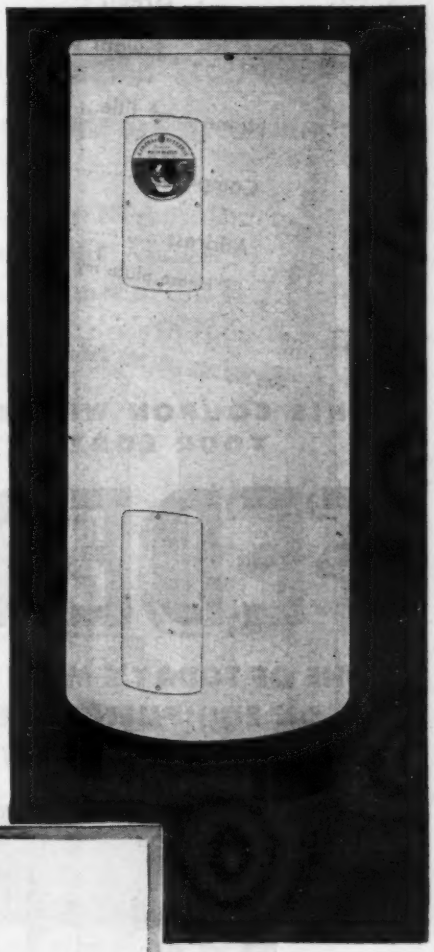
The pattern curriculum used and source of speakers for each subject will best indicate scope of the plan. 1. "Why plan now?"—Speakers mostly architects. 2. "Contemporary homes"—Architects and university professors. 3. "Site selection"—Realty men. 4. "Building laws"—City inspectors, mostly. 5. "Functional planning"—Architects and university professors. 6. "Home furnishings and color harmony"—Interior designers. 7. "Color in the home"—Paint manufacturers. 8. "Planned storage space"—Architects and mill work manufacturers. 9. "Heating and air conditioning"—Utilities and manufacturers. 10. "Home insulation"—Manufacturers. 11. "Plumbing"—Manufacturers and plumbing association. 12. "Adequate wiring"—Utilities and some manufacturers and distributors of wiring materials. 13. "The kitchen and the laundry"—Handled separately by home economists of large electrical manufacturers. 14. "Lighting"—Specialists from utilities, associations and manufacturers. 15. "The makings of your home"—General contractors and architects. 16. "Budgeting for your home"—Ar-





PAGE FROM WESTERN MASSACHUSETTS ELECTRIC'S BOOKLET (left) explaining cost of farm line extensions. Map of company's served cities and towns (right) to emphasize scope of available service under new schedule for extensions

Have any questions about the postwar water heater business?



Then send for General Electric's *Survey on Water Heater Trends.*

This FREE booklet is a summarization of what we believe is the most extensive survey ever made of water heater programs of electric service companies. To compile it, we received detailed information from some 400 electric service companies, serving more than 22,000,000 meters . . . over 76% of all U. S. domestic meters.

It answers such questions as . . .

- **How many meters are now served by companies having water heater rates?**
- **How many companies provide for the use of water heaters made to "EEI-NEMA" standards?**
- **What about charging periods and control?**
- **How many companies will sell or actively support water heater usage postwar?**

And after you have read this important survey, please feel free to write us about any other questions you may have about the use of electric water heaters to build load in your territory.

This survey was made in the interest of the industry as a whole. From it, and from our frequent contacts with electric service companies all over the country, we believe we have the most complete and up-to-date information on water heater trends of any water heater manufacturer.

This information indicates that substantial progress has been made toward a greater standardization of water heater requirements . . . and that service companies can obtain a far greater volume of profitable business than ever before from easily installed, trouble-free, load-building G-E Automatic Electric Water Heaters.

For your free copy of this helpful booklet, fill in and mail the coupon below today.

The G-E Automatic Electric Water Heater . . .

for more sales, greater profits.

The G-E Automatic Electric Water Heater is designed from top to bottom for a long, trouble-free life.

Because it is the kind of water heater that customers can buy and forget, it is easier to sell. It requires less service than any major appliance you sell . . . and that means a greater profit for you on every installation.

The G-E Automatic Electric Water Heater is heated by the G-E Calrod with the Gelva Seal . . . the heating unit that is designed to provide the maximum amount of hot water in the shortest possible time, and at the lowest cost.

And Calrod will perform efficiently, month in and month out. Of the thousands of Calrod units placed in service in ranges and water heaters since 1932, less than one half of one per cent have been returned to us for service or repair.

Stock and sell G-E Automatic Electric Water Heaters . . . the heaters that will bring your customers the most satisfaction . . . bring you the greatest profit.

AUTOMATIC ELECTRIC

WATER HEATERS

GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY
Distribution Services Division, Bridgeport, Conn.

Please send me a FREE COPY of General Electric's Survey on Water Heater Trends:

NAME_____

COMPANY_____

ADDRESS_____

FEDERAL ELECTRIC PRODUCTS COMPANY, INC.
50 Paris Street, Newark 5, N. J.

Yes! . . . I want a copy of the FEDERALOG

Name and title .....

Company .....

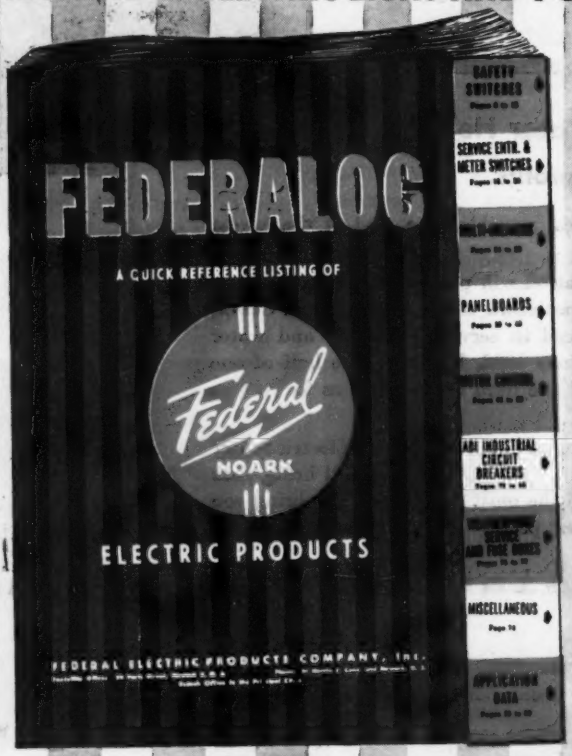
Address .....

☐ Please place my name on your mailing list for all future material

THIS COUPON WILL BRING YOU YOUR COPY OF THE

FEDERALOG

ONE OF TODAY'S MOST IMPORTANT CATALOGS ON EQUIPMENT FOR THE CONTROL AND DISTRIBUTION OF ELECTRIC LIGHT AND POWER



• No data file on electrical equipment is complete without a copy of the FEDERALOG . . . a dependable guide to the newest developments in Motor Controls, Safety Switches, Circuit Breakers, Service Equipment, Panelboards and Multi-Breakers.

FEDERAL ELECTRIC PRODUCTS COMPANY, INC.

EXECUTIVE OFFICES: 50 PARIS ST., NEWARK 5, N. J. • PLANTS: HARTFORD, CONN. • NEWARK, N. J.

chitects. 17. "Arranging your financing"—Bankers and loan associations. 18. "Landscaping"—Landscape architects and nurserymen. 19. "Protecting your investment"—Title insurance companies.

A total of 319 meetings were held in thirty cities with total attendance of 76,096, making an average attendance of 181.3 at each meeting. About half of the institutes consisted of ten meetings and the rest of nine meetings. In all cases the institutes were held under the auspices of the adult education department of the particular school system in the community.

Cost was borne almost entirely by manufacturers, distributors, merchants, utilities and associations participating in the plan, including in many localities the building trades councils. The only expenses not borne by these groups was the printing of the programs, which was defrayed by the public schools. Cost figures are available for the 23 institutes held in northern California with 192 meetings. Total amount raised by local groups was $19,071, which was spent for printing, advertising and local promotional expenses.

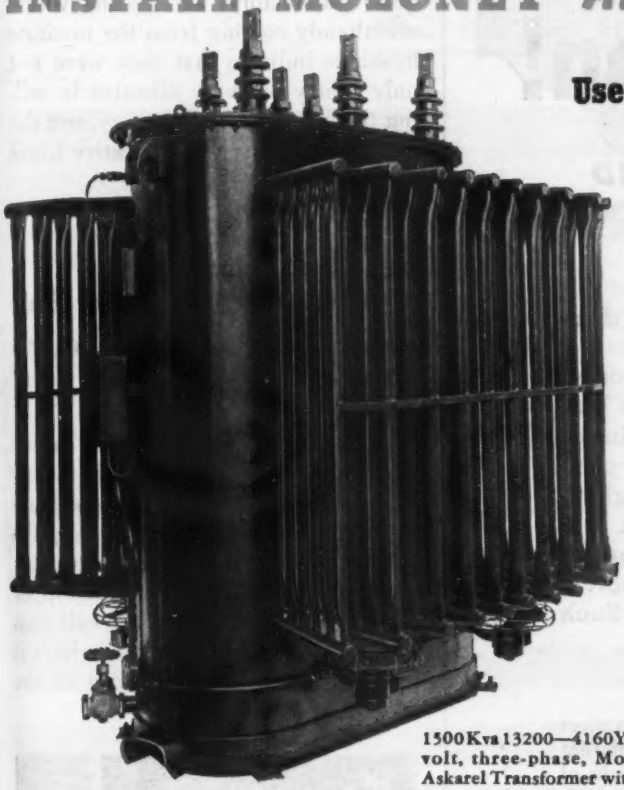
Organizational Work

Institutes were handled on a definite registration basis and all were encouraged to take the full course. Those attending were a select group of people who were definitely going to build or modernize. Noticeable in audiences were young men and their wives, including many service men. From question card checks made at a number of meetings is was determined that the people in attendance at all meetings represented about $65,000,000 in new home building and $20,000,000 in remodeling—post-war.

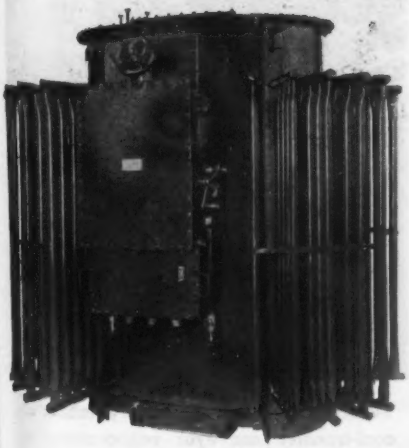
The outstanding success of the institutes was largely due to the thorough organizational work done by a representative committee. A guide was issued to local groups telling them the steps to take in organizing and they were further aided by a speakers bureau from which to draw to supplement local speakers. Without this speakers bureau it would have been impossible for local groups to have operated.

Institutes were conducted on a strictly non-commercial basis. In northern California the plan was initiated and largely carried through by the Pacific Coast Electrical Assn, the

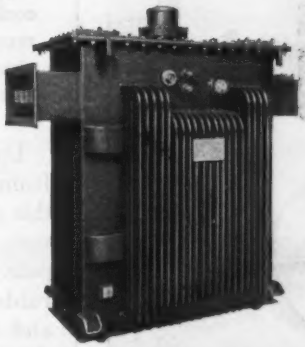
FOR *SAFETY* AND *ECONOMY*—
INSTALL MOLONEY *ASKAREL TRANSFORMERS*



1500 Kva 13200—4160Y/2400 volt, three-phase, Moloney Askarel Transformer with fans controlled by liquid temperature for increasing capacity.



1000 Kva 2400—240 x 480 volt Askarel Transformer with HV selector type disconnect switch and terminal chamber equipped with two sets of cable connections to provide a preferred and emergency feeder to the transformer.



500 Kva 4160—208Y/120 volt, three-phase, sixty cycle, Askarel Load Center Transformer with throats for connection to primary and secondary switchgear.

Used Where Non-inflammable Transformers are Required—Either Indoors or Outdoors

MOLONEY Askarel Transformers are cooled and insulated with Askarel, a non-inflammable liquid. Because of this fact, these transformers are suited to use in applications where oil-cooled transformers would be hazardous to life and property.

Askarel Transformers are ideally adapted to indoor installation in hospital, school, hotel, theatre, office and apartment buildings—in industrial plants, mills and in central stations. They are of weatherproof construction and may be used in outdoor installations. These include in mines, on roofs of buildings, in street and sidewalk vaults for a-c network systems and many other applications where oil-cooled transformers might constitute a hazard.

These transformers effect savings in initial installation costs due to the elimination of expensive fireproof vaults. By locating the transformers at the center of the electrical load, further economies are effected by eliminating long, expensive runs of secondary copper and by providing improved voltage regulation. Moloney Askarel Transformers are available in the same ratings as oil-cooled transformers.

☆ ☆ ☆

Askarel has been approved by the Underwriters' Laboratories for use as an insulating medium and the National Electrical Code permits the installation of Askarel filled transformers indoors without the necessity for providing a fire-proof vault.

MOLONEY ELECTRIC COMPANY
St. Louis, U. S. A.

MOLONEY ASKAREL (NON-INFLAMMABLE LIQUID-COOLED) TRANSFORMERS

LOW COST Rust Prevention!

USE HARPER NON-FERROUS AND STAINLESS FASTENINGS

Rust is the Great Destroyer. Every year it causes damage of "war debt" proportions.

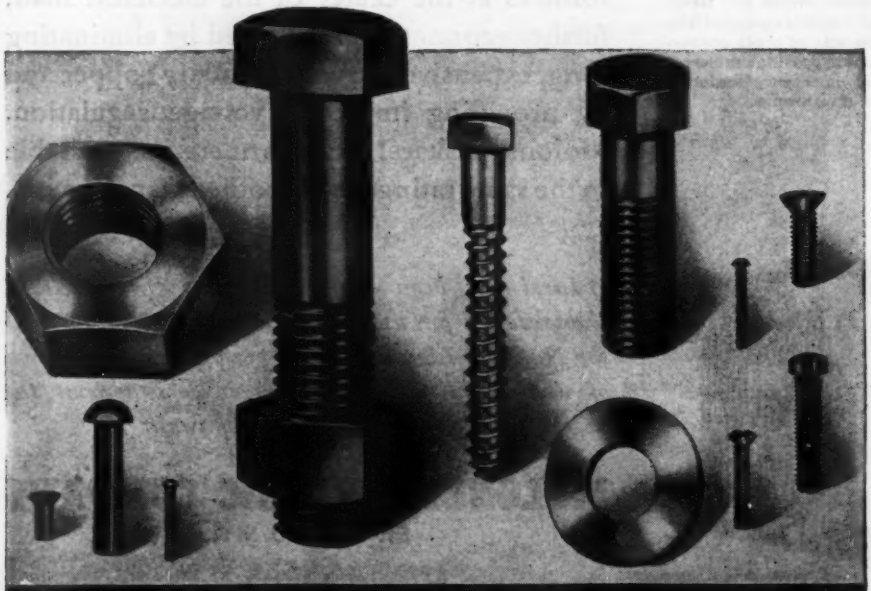
Fortunately, the cost of preventing rust and corrosion through the use of Harper Everlasting Fastenings is low. Of course, the first cost of a bronze bolt or a stainless screw is more than a comparable fastening made of common steel. Yet the difference in price is small, particularly when considered in relation to the total cost of a machine, instrument or other fastened assembly. Everlasting fastenings add longer service life to your product... and the ability to perform under tough conditions. Such qualities provide a big advantage over competition.

4360 ITEMS IN STOCK

Harper is known as "Headquarters for Non-Ferrous and Stainless Fastenings"... carries large and complete stocks of 4360 different items and is continually adding others... maintains large stocks of metals in bars, rods, wire, sheet and other basic forms from which special fastenings can be quickly made. Write for 1945 Catalog.

THE H. M. HARPER COMPANY
2611 Fletcher Street • Chicago 18, Illinois

BRANCH OFFICES:
New York City • Philadelphia • Los Angeles • Milwaukee • Cincinnati • Houston.
Representatives in Principal Cities



HARPER
EVERLASTING FASTENINGS

BRASS • BRONZES • COPPER • MONEL • STAINLESS

Northern California Electrical Bureau and the utilities.

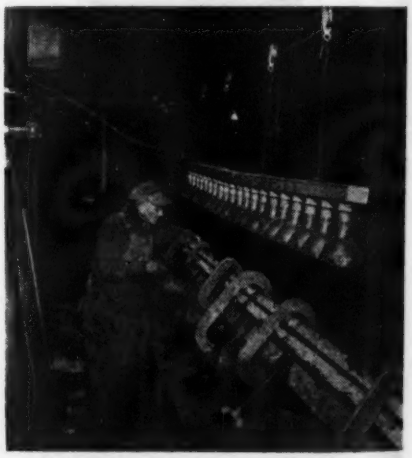
The attendance record at these home planning institutes is considered quite satisfactory, and results which are already coming from the institute meetings indicate that they were not only timely but very effective in selling the adequate wiring story and the uses of electricity to prospective home builders.

•

Infra-Red Lamps Dry Coal Transfer Belt

D. F. ESTES* and A. L. POTTER*
Electricity Sales Dept.
Commonwealth Edison Co.
Chicago, Ill.

Each year the Rail to Water Transfer Co., Chicago, contracts to transship some 2,000,000 tons of coal from rail cars to cargo boats plying the Great Lakes. Coal is transferred. customarily, by dumping it from hopper cars onto a 54-in. conveyor belt that carries it up a 300-ft. incline where it drops by chute into the hold of the lake vessel.



TWENTY infra-red lamps dry fabric of coal-transfer conveyor preparatory to recementing separated plies. Clamps, above, are being adjusted after cement has been applied

During the lake-shipping season, from about March 15 to October 15, this conveyor is in daily use with only very short periods available for repair. Consequently when edges of the rubber covered belt become frayed and fabric plies separate, speedy on-the-job repair is essential.

Drying of the belt fabric, which is exposed to the weather and becomes watersoaked, is necessary before the separated canvas plies can be rece-

* District Sales Representative and Application Engineer respectively.

Why an OZALID machine

increases in value from year to year

1935—4 types of OZALID prints

• Reasons enough to install an Ozalid machine then. (Thousands did!)

For the first time, it was possible to reproduce an engineering drawing, office form, typed sheet, etc.... as any one of *four different types* of prints.

Not *negative* prints—but easy-to-read *positive* prints... with *black, blue, red* or *sepia* lines or images on white paper.

And this versatile, new method was *faster, simpler,* more *economical* than any other!

It allowed every Ozalid user to produce the desired type of print *in seconds*... in clean, compact equipment installed right in the drafting room or office.

1945—10 types of OZALID prints

• Since 1935, Ozalid has created product after product—which can be processed in the same unique manner in *any* Ozalid machine.

So that today you can make *10* types of prints... and use them in innumerable ways. Ways you will consider all the more amazing if you've been seeing, using, and "stretching" only *one* type of print!

1. **Black-line**
2. **Blue-line**
3. **Red-line**
4. **Sepia-line Intermediate**
5. **Transblack Intermediate**
6. **Transparent Cloth**
7. **Transparent Foil**
8. **Opaque Cloth**
9. **Chartfilm**
10. **Dryphoto**

Each one of the ten OZALID types has its advantages. For example, you can use different colors to identify work prints of different departments. You can employ Ozalid Intermediates to save time and labor when changing art and drafting designs or financial reports. And new *Ozalid Dryphoto* when you want to reproduce continuous tone photographic material for sales, advertising, and general display purposes.

Furthermore, you'll find many personalized uses for Ozalid... recognizing it as not merely a reproduction process, but as a new graphic art which projects the use of your equipment beyond the drafting room and shop... to *all* departments!

Ten types of prints is only the beginning for Ozalid. And the machine you invest in today—besides giving you immediate advantages—will provide even greater versatility tomorrow.

Write for *free* catalog and OZALID samples to Dept. 14.

OZALID

Division of General Aniline and Film Corporation
Johnson City, New York

OZALID IN CANADA—HUGHES-OWENS CO., LTD., MONTREAL

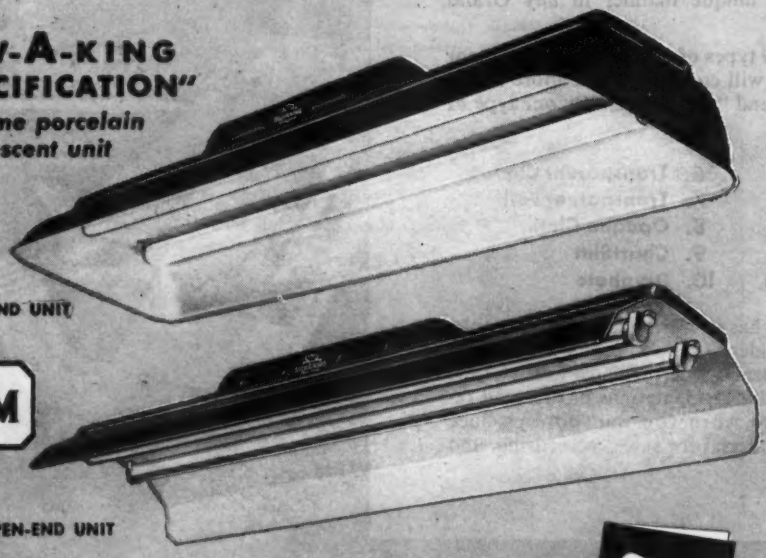
THE NAZIS HAD A WORD FOR IT

Ersatz!

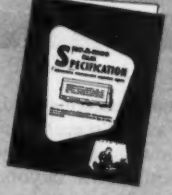
Not so long ago, lighting fixtures were made of various substitutes, held together with scarcely more than a prayer.

Some lighting products, we're told, are still made that way. But not SILV-A-KING products! Ever since Uncle Sam gave us the nod, nothing but the best of pre-war (and post-war!) materials and engineering have gone into SILV-A-KING fixtures. That's why today's SILV-A-KING fluorescent fixtures are drawn one-piece and seamless of heavy gauge steel, have a porcelain-enamel finish that will maintain initial reflectivity *and last for a lifetime*. That's why SILV-A-KING fixtures embody a host of important construction features that make for better performance .... improved appearance.

SILV-A-KING "SPECIFICATION"
Lifetime porcelain fluorescent unit



Nothing "ersatz" about this bulletin! It's No. 45FS, fully describing the "Specification" model in both open and closed types.



SILV-A-KING LIGHTING EQUIPMENT

BRIGHT LIGHT REFLECTOR CO. INC.
Metropolitan & Morgan Aves., Bklyn. 6, N. Y.

mented. It was suggested by the Commonwealth Edison Co. that an infra-red channel, consisting of 20, 250-watt, R-40 reflector lamps on 6-in. centers would speed this drying. The recommendation was adopted by J. A. Emrick, superintendent of the transfer company, and the illustrated equipment was built.

With stand and adjustable bracket the portable infra-red bank will dry a 15 to 20-ft. section of belt uniformly in about ½ hr. This length is the longest that can be properly repaired at one time.

This installation, which went into service early in 1944, has been used whenever repairs have been required, not only to dry out the fabric before recementing, but to affect a 4-hr. cure of the rubber cement and coating as well. It has not been necessary to remove the 750-ft. belt and send it away for repair.

•

Banks Cooperate in Electric Promotion

Supplementing consistent newspaper advertising on the theme of "Octopus Outlets," distribution of over 220,000 folders promoting electric service in the home is being done in the Philadelphia area by thirteen banks in cooperation with the Electrical Association of Philadelphia.

"OCTOPUS OUTLET" picture features each advertisement in adequate wiring campaign in Philadelphia area

The folder urges that money be borrowed to take "3 Steps to Modern Living;" repair and improve the home, modernize electric wiring, and buy electric appliances. Although little or nothing can be done at present in any of these three steps, it is felt that selling the idea is an important preparation for future more specific efforts.

WESTINGHOUSE STARTS THE SPADEWORK FOR A BUMPER CROP OF POSTWAR SALES IN THE FERTILE RURAL MARKET

These two are typical of the full-page ads appearing regularly in
COUNTRY GENTLEMAN · FARM JOURNAL
PROGRESSIVE FARMER · ELECTRICITY ON THE FARM
A total readership in rural America of 22,440,000

esterday
TOMORROW..more and more farm folks will know
"There's a lift to living Electrically!"
"Gee, mom, remember how we used to have to scrub 'em?"
Westinghouse
Electric Ranges and Water Heaters
Tender Spring Broilers
12 months of the year..with
"REACH-IN CONVENIENCE"
Westinghouse
Home Freezers

The farmer's in the bucks. Farm modernization is first in postwar plans. Electric power is a "must" for profitable farming. America's Rural Market is plenty fertile for a bumper crop of Electric Range and Home Freezer sales!

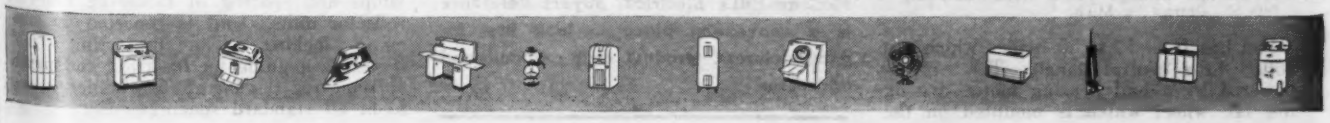
This spadework NOW will clinch volume sales for Westinghouse retailers. Dominating full-page ads appear consistently in four big rural magazines that blanket Rural America.

Get in on the harvest that's sure to follow this spadework. Ask your near-by Westinghouse Appliance Distributor for the complete story of the Westinghouse Full Line Franchise.

WESTINGHOUSE ELECTRIC CORPORATION
APPLIANCE DIVISION · MANSFIELD, OHIO
Plants in 25 Cities . . . Offices Everywhere

30 MILLION PRE-WAR
Westinghouse
ELECTRIC HOME APPLIANCES
YOUR PROMISE OF STILL FINER ONES TO COME

Tune in: John Charles Thomas, Sunday 2:30 EWT., NBC • Hear Ted Malone, Monday through Friday, 11:45 A.M. EWT., American Broadcasting Company Network



NEW EQUIPMENT

Power Supply

Reactor regulated power packs: 24, 36, 48, 110, 120, 135, 250 and 500 volts d.c.; capacities from 12 to 880 volt-amp.; regulation with five percent; ripple within one percent. **Amplifier Co. of America**, 398 Broadway, New York 13, Jersey City 5, N. J.

Power packs employ rectifier tubes and are provided with built-in thermal time delay relays which apply plate supply voltage approximately 30 seconds after rectifier filaments are heated. Units are equipped with recessed male receptacles, female outlets, power line switch, pilot indicator and fuse.

•

Vacuum Gage

Model No. "276 AA" high-vacuum gage: McLeod type; two ranges 0 to 5,000 microns and 0 to 500 microns. **F. J. Stokes Machine Co.**, Philadelphia 20, Pa.

Gage has a built-in condensable-vapor trap which consists of a renewable chemical cartridge and which is said to protect it from such vapors as water, oil and alcohol. Change in cartridge color is indication of saturation and need for renewal. Other features reported are device for adjustment of zero point, shut-off valve, portability, minimum amount of rubber tubing and plastic casing.

•

Roof Fan

Wolverine roof fan: sizes 30 to 60 in.; capacities 5,650 to 45,275 cu.ft. per min.; motor sizes ½ to 5 hp. **Belanger Fan & Blower Co.**, 1237 18th St., Detroit 16, Mich.

Fan has from 12 to 20 blades which are bolted to a central flange. The unit is powered by a ball bearing motor driving the fan wheel which is mounted on the shaft. The square case and hood are made of prime steel sheets reinforced with angle iron. The hub assembly of the fan is supported by welded angle iron. Unit is reported as insulated against loss of heat in winter or conditioned air in summer.

•

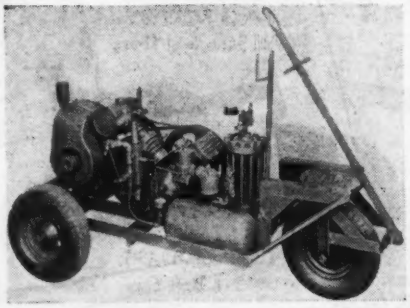
Hot Plates

Laboratory hot plates; temperatures from 110 deg. F. to 950 deg. F.; three sizes 10 in. by 12 in., 12 in. by 20 in., 12 in. by 30 in. **Lindberg Engineering Co.**, 2450 W. Hubbard St., Chicago 12, Ill.

Units have an electrical input control mounted on the front of the hot plate which is said to permit the manual selection of any degree of heat within the temperature range. The hot plates are fitted with top plates which are said to resist warpage, corrosion and minimize discoloration. The hot plates are made of coiled nickel-chromium elements and refractory type element holders enclosed, on the sides and bottom, by insulation. This assembly is protected by a sheet metal housing providing a chamber beneath the unit for the wiring.

•

Compressor Unit

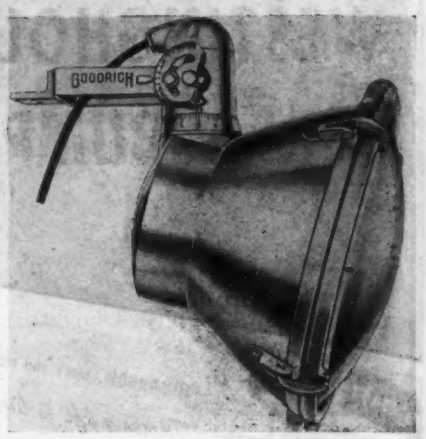


Model "2000" compressor unit: low pressure 100 p.s.i.; high pressure 2000 p.s.i. **Pacific Airmotive Corp.**, 6265 San Fernando Rd., Glendale, Cal.

Unit is mounted on three 16 by 4 pneumatic tires and has a combination tow hitch and manual tongue. The compressor is equipped with a constant speed unloading system which is operative both at 100 p.s.i. and 1,500 to 2,000 p.s.i. by a simple changeover. Unit is said to remove condensed moisture.

BUYING ELECTRICAL EQUIPMENT?—McGraw-Hill's *Electrical Buyers Reference* is a convenient place to look first for manufacturers' product data, names and addresses.

Floodlight



"Lumo" floodlight; calibrated adjustment; narrow or medium beam. **Goodrich Electric Co.**, 4600 Belle Plaine Ave., Chicago 41, Ill.

A long range floodlight for illuminating large sports areas (football fields, baseball diamonds, etc) has a calibrated bracket mounting. This is said to simplify installation and make it easy to maintain accurate focusing. Reflector is serviced by tipping upward and back, enabling the serviceman to work from behind on the crossarm or a platform. Floodlight is then returned to original calibrated setting. It is finished in Alzak aluminum and is available in either open style or with water-tight, heat resisting glass lens.

•

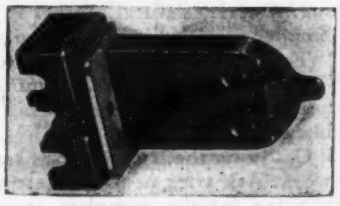
Ballast

Model "W2-48" fluorescent lamp ballast; 118-volt; 60-cycle; 90 to 95 percent average power factor normal line current 0.85 amp.; approximate loss 20 watts. **Sola Electric Co.**, 2525 Clybourn Ave., Chicago 14, Ill.

Ballast is designed for the operation of two 40-watt fluorescent lamps. Leads may be brought out at ends or bottom. Other features reported are minimum temperature rise, quiet operation, and high efficiency.

•

Lamp Holder

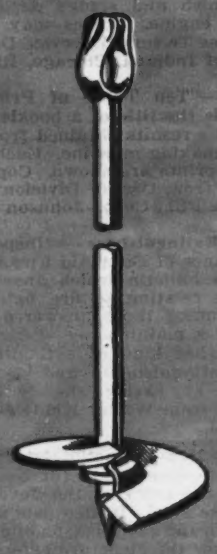


"Flex-Loc", fluorescent lampholder; grips both sides of lamp pins; automatic locking; plastic; withstand impact test of 2,000 ft.-lb. **Lloyd Products Co.**, Providence 3, R. I.

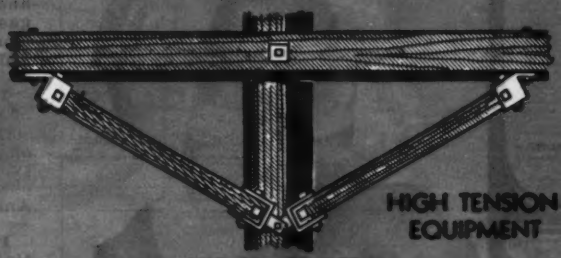
Holder is said to be flexible, adjusting automatically to variations in length of lamps and spacing of mounting holes in reflector units. Unit is reported as automatic locking. The projecting "tab" serves as a guide for insertion and means of removing the lamp. The holder is said to fit all standard spacings.

1945 CONSTRUCTION

"Hang the Load on Hubbard Hardware!"

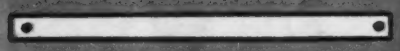


STEELWING ANCHORS
2-3/4" to 10" Diam.
1-1/2 Ft. to 8 Ft. Lengths



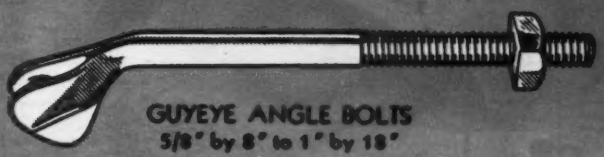
WOOD BRACES
All Sizes—Many Types

HIGH TENSION EQUIPMENT

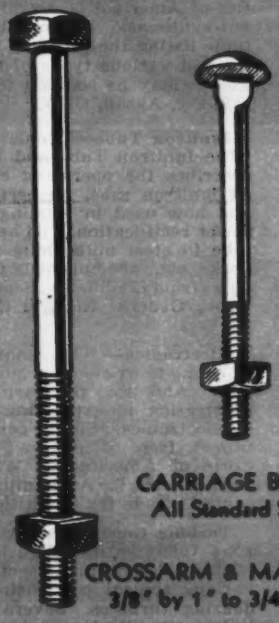


CROSSARM BRACES
Flat, Ribbed, One Piece, Wood and Steel

PINS
All Sizes
and Styles



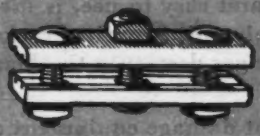
GUYEYE ANGLE BOLTS
5/8" by 8" to 1" by 18"



CARRIAGE BOLTS
All Standard Sizes

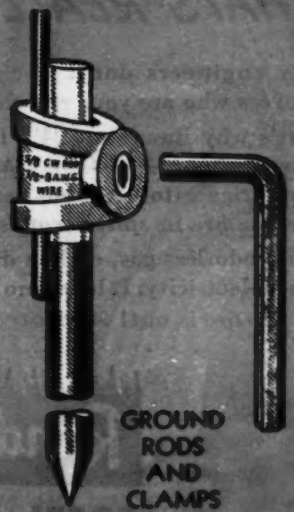
CROSSARM & MACHINE BOLTS
3/8" by 1" to 3/4" by 28" Sizes

LAG SCREWS
All Standard Sizes



GUY CLAMPS
1-2-3-4 Bolt Sizes

EYE NUTS
All Sizes
and Styles



GROUND RODS AND CLAMPS
Hubbard-Copperweld

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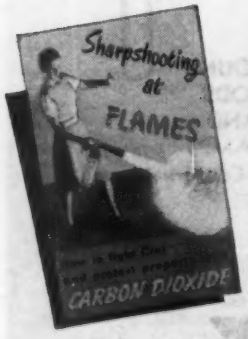
"HERE'S AN EXTINGUISHER THAT'S REALLY PANIC-PROOF!"

Safety engineers don't use extinguishers. Actually, it's *the employees* who are your real fire-fighters.

That's why Randolph "4", lightweight and easy to use, is *ideal* for the amateur. Just ONE HAND snaps this unit from its bracket . . . one trigger-touch sends carbon dioxide gas deep into the blaze —kills the fire in *split-seconds!*

A dry, odorless gas, carbon dioxide cannot damage equipment or conduct electricity. It leaves no stain or mess . . . actually disappears when the fire is out! *Approved by Underwriters' Laboratories.*



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FREE! Send me your new, 16-page booklet "Sharpshooting at Flames." Illustrates how to fight fires and protect property with fast-action carbon dioxide gas.

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Address_____

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TECHNICAL LITERATURE

Power Factor—A 20-page booklet entitled "The ABC of Power Factor" explains in detail what power factor is, why it is detrimental, how to obtain a high power factor, and how to make power factor calculations. Copies may be secured from Electric Machinery Mfg. Co., East Minneapolis 13, Minn.

Lubrication—Bulletin No. 45-1 contains the history of the development of a heavy duty diesel lubricating oil, describes the control of fuel soot and carbon deposits, and varnish and sludge deposits of the gasoline engine. Copies may be secured from Sales Technical Service Dept., Standard Oil of Indiana, Chicago, Ill.

Prints—"Ten Types of Prints Instead of One" is the title of a booklet which describes the results obtained from one type of print making machine. Each of the ten types of prints are shown. Copies may be obtained from Ozalid, Division of General Aniline & Film Corp., Johnson City, N. Y.

Fire Extinguishers—"Inspection and Maintenance of First Aid Fire Extinguishers" is a bulletin which answers typical questions relating to fire fighting equipment. Among those answered are: why you need a maintenance system, who's in charge, what kind of extinguishers, how many extinguishers, and location and marking of extinguishers. Copies are available from Walter Kidde & Co., Belleville, N. J.

Steel—Non-Magnetic Applications for Manganese Steel (Bulletin No. 1144-NM) contains the story of the development of manganese steel. It also lists some of the properties and contains photomicrographs which show the structure before and after heat treating. Copies may be secured from the American Manganese Steel Division, American Brake Shoe Co., Chicago Heights, Ill.

Synthetic Rubber—Booklet 8000 contains a detailed description of the properties of Ameripol D, an oil and heat resistant synthentic rubber. Also contained is a table listing the property relation of natural and various types of synthetic rubber. Copies may be secured from B. F. Goodrich Co., Akron, Ohio.

Ignitron Tube—Booklet ETI-21 entitled "The Ignitron Tube and How It is Used" describes the operating characteristics of an ignitron tube, its performance ratings and how used in welding circuits and in power rectification. The applications of the tube in steel mills, mines, factories, drydocks, etc., are outlined. Copies are available from Publicity Section, Electronics Dept., General Electric Co., Schenectady, N. Y.

Electronics—"The Amazing Electron" is a booklet written in non-technical language and uses the cartoon technique of illustration in explaining the basic facts of electronics. Single copies may be obtained free of charge from Electronic Corp. of America, 45 W. 18th St., New York 11, N. Y. A handling charge of five cents is made for quantities of 20 or more.

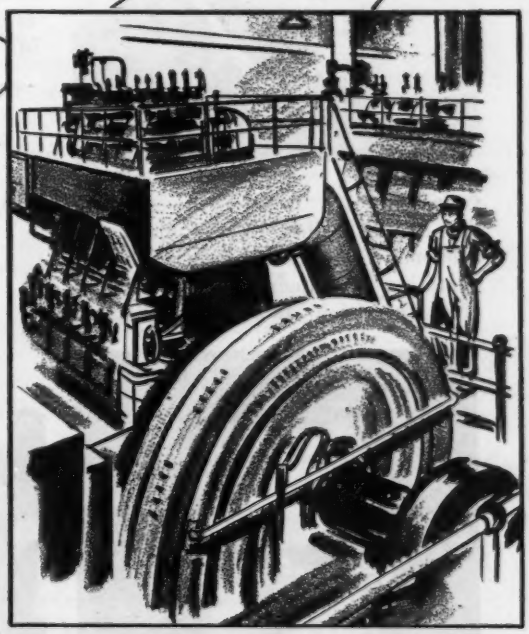
Turbine Generators—A 46-page bulletin (No. 1960) entitled "Turbine Generators" contains longitudinal section drawings of various typical condensing and non-condensing turbines. Several typical installations are illustrated in various sizes up to 4,000 kw. Copies may be secured from Moore Steam Turbine Division, Worthington Pump & Machinery Corp., Wellsville, N. Y.

Seeing—"Light from Floors" is a 24-page booklet which explains the advantages of a light-reflecting concrete floor. Tables, curves and photographic illustrations are utilized in presenting the reflection story. Copies may be secured from Universal Atlas Cement Co., Chrysler Building, New York City.

Do you know that . . .

LAST YEAR MORE AIRLINE PASSENGERS IN THE UNITED STATES FLEW ON SINCLAIR PENNSYLVANIA MOTOR OIL THAN ON ANY OTHER OIL... SINCLAIR AVIATION GASOLINE WILL AID FLYING ON NATIONAL AND INTERNATIONAL ROUTES.

SINCLAIR TANK TRUCKS OPERATE OUT OF 2000 WHOLESALE BULK PLANTS WHICH SERVICE INDUSTRIAL PLANTS, AS WELL AS MANY THOUSANDS OF SINCLAIR DEALER STATIONS, WITH PETROLEUM PRODUCTS.



SCUFFING AND RING STICKING ARE AVOIDED... PERFECT SEAL AND FULL DELIVERY OF POWER ARE ASSURED BY SINCLAIR RUBILENE AND GASCON OILS... TEN-OL, A HIGHLY EFFICIENT NEW LUBRICANT FOR DIESELS, FULLY MEETS U. S. ARMY SPECIFICATION 2-104 B.

SINCLAIR *IS EQUIPPED TO SERVE YOU BETTER!*

FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE SINCLAIR REFINING COMPANY, 630 FIFTH AVENUE, NEW YORK 20, N. Y.

NEWS ABOUT PEOPLE

A. L. Pollard Assigned New Executive Duties

A. L. Pollard, for the past 15 years connected with the Puget Sound Power & Light Co., Seattle, has been appointed general superintendent of operations. In the course of his association with

A. L. Pollard

the Seattle utility, Mr. Pollard has held many responsible positions in the operating department. His new duties are supervision and coordination of

R. W. Joyce

activities of the division of power supply and the six operating divisions of the company in connection with construction, operation and maintenance. Mr. Pollard is a member of A.I.E.E.

At the same time R. W. Joyce was appointed general commercial manager of the company, and A. S. J. Steele, formerly suburban manager of the central division, was promoted to succeed Mr. Joyce as northeastern division manager.

Mr. Joyce, whose new assignment makes him responsible for carrying out policies relating to rates, contracts and rural electrification, has been with Puget Power since 1928. He has held managerial positions in the central, western and southern divisions.

Mr. Steele, a graduate in electrical engineering from the University of Texas, joined the utility staff in 1930 as manager of the western district and since 1934 has been suburban manager of the central division. He has been associated with a number of electric utilities during the past 25 years.

W. H. Schlosser Heads New Canadian Utility Company

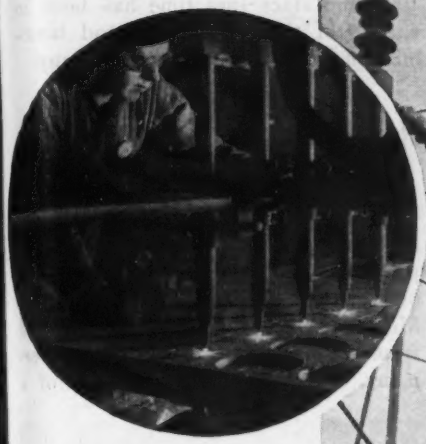
W. H. Schlosser has been named president of Northland Utilities Limited, organized recently through the acquisition of seven power plants, former properties of the Dominion Electric Power Co. When the government of Saskatchewan took over Dominion Electric Power this year it disposed of the plants not located in the province of Saskatchewan. Four of the plants, forming the nucleus of the new company, are in Alberta, two in British Columbia and one in Manitoba.

Other officers include: vice-president, N. W. Dubois and secretary, D. E. Johaneson.

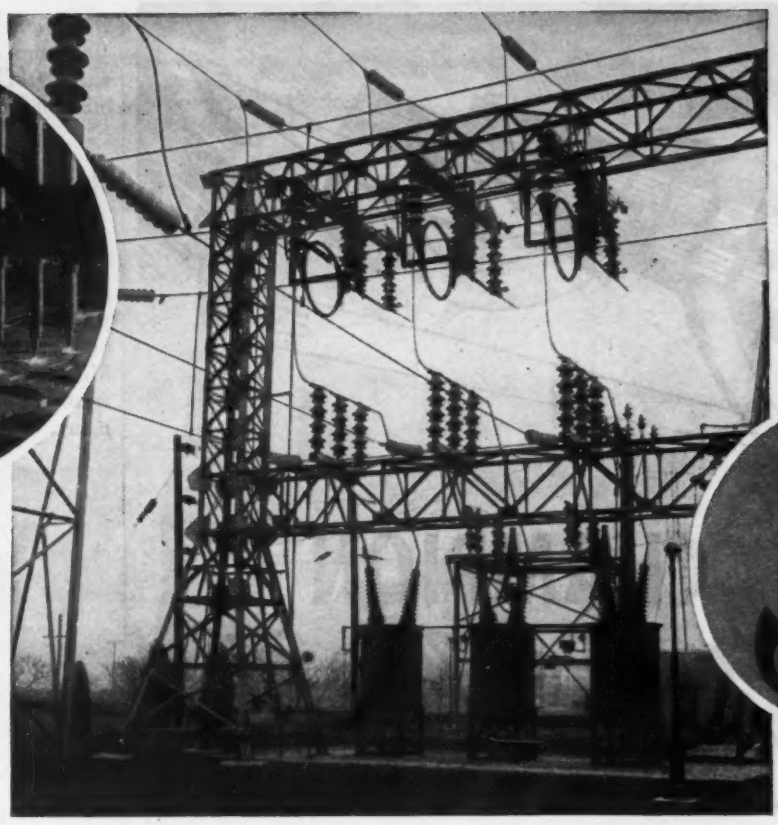
Mr. Schlosser entered the electrical business in the United States at the end of the first World War, but in 1926 transferred his interests to Canada, organizing a company called Northern Light & Power Ltd. He acquired a number of small properties in the Province of Saskatchewan, which were later sold to Canadian Utilities Ltd. Mr. Schlosser was made manager of the Dominion Electric Power Limited in 1929 and has been employed in that capacity since that time.

A graduate of the University of Minnesota, Mr. Dubois went to Canada in 1927 with the Northern Light & Power Co. Ltd. He became identified with the

OBSERVATIONS ON AMERICA—Several distinguished Chinese engineers are at present in this country, studying American methods and equipment and forming connections that will develop into channels of trade when China can resume normal production. Under the guidance of these engineers an electrical manufacturing industry was established in China. They are shown at the home of their former professor, Gordon Thompson, now chief engineer of Electrical Testing Laboratories, Inc., New York. Front row (l. to r.): C. Yun, Central Electrical Manufacturing Works; K. C. Jen, Central Insulator Co.; W. K. Chow, Central Radio Manufacturing Works; K. P. Pao, Ipin Electricity Co. Back row (l. to r.) T. Y. Penn, Central Broadcasting Administration; Mr. Thompson; T. S. Wang, Central Radio Manufacturing Works and Y. C. Hsu, machinery plant manager



Ryerson Flame cutters, high-speed hack saws and shears prepare steel quickly and accurately.



Call for quick action on small orders or large.

4 Things to Know About Steel

1. Where to Find Largest Stocks—The thousands of kinds, shapes and sizes of steel in eleven Ryerson Steel-Service plants are still the largest, most complete stocks available anywhere. This means that, despite shortages in some sizes, you can be more certain of getting the steel you need from Ryerson.

2. Technical Service—For more than 100 years Ryerson has supplied steel from stock. During that period, Ryerson technical men have gained much practical experience about the best type of steel for each application in the electric power industry. This service is available to you on any problem of selection or fabrication.

3. Fast, Accurate Preparation—Ryerson saves you time and expense—prepares steel to your exact specifications with modern, precision equipment. Facilities include high-speed hack saws and shears, batteries of flame cutters, punches—everything needed to cut steel to the size and shape you need in the shortest possible time.

4. Prompt Delivery—Whether you need a single piece of steel or many tons you'll get prompt action from the nearest Ryerson plant. Phone, wire, or write for any steel requirement. And if you do not have a copy of our latest Stock List and Steel Data Book, we'll be pleased to send one.

RYERSON SERVICE TO ELECTRICAL INDUSTRY INCLUDES:

Steel Bars, Mild Steel, Alloy, Stainless—Rounds, Squares, Flats—Hot Rolled and Cold Finished—Shafting, etc.

Structural Steel including I-Beams, Angles, Channels, Tees, Zees.

Plates and Sheets—all kinds including plain, galvanized, corrugated for roofing, siding, etc.

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Allegheny Stainless Plates, Sheets, Strip Bars, Tubing, etc.

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Alloy Steels, Tool Steels.

Inland 4-way floor plate and stair treads.

Hi-Bond Concrete Reinforcing Bars, Wire Mesh and allied building materials.

Bolts, Nuts, Washers, Rivets, etc.

Welding Rod, Babbitt, Solder.

Metal Working Machinery and Tools.

JOSEPH T. RYERSON & SON, INC., Steel-Service Plants: Chicago, Milwaukee, Detroit, St. Louis, Cincinnati, Cleveland, Pittsburgh, Philadelphia, Buffalo, New York, Boston.

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CHAMPION

Lighting Puts Your Plant A Long Jump Ahead

Fine quality Fluorescent and *Incandescent* Lamps for industry are lamps bearing the Champion Diamond mark.

You need lamps of Champion Quality.

But you also need to be sure you use the right lamps to make the most of them for every plant and office activity and location.

That is why we have a lighting engineering service, prepared to provide you with experienced and unbiased counsel, and available to you without charge or obligation.

And that is why we offer you this Champion Maintenance Manual M, chock full of helpful information on good lighting and ways to get the very best and longest service out of your lamps. It's yours for the asking. Simply let us have your name, position and company address.

CHAMPION LAMP WORKS

Lynn, Massachusetts

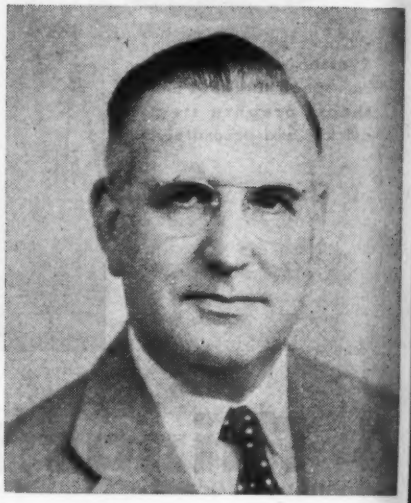
A DIVISION OF CONSOLIDATED ELECTRIC LAMP CO.

Dominion Electric Power Limited in 1929 and since that time has been in charge of the distribution and transmission lines system of the company.

•

Rome Cable Corp. Elects Schatzel Vice-President

Announcement has been made of the election of Rudolph A. Schatzel as vice-president and director of engineering of the Rome Cable Corp., Rome, N. Y. Mr. Schatzel has recently returned from a stay of several weeks in Germany, where he was a member of a



R. A. Schatzel

group of scientists sent to Europe for the investigation of German technology. Prior to joining Rome Cable, he was director of research for General Cable Corp., with offices at Bayonne, N. J.

A graduate of Union College, Schenectady, Mr. Schatzel entered the employ of the General Electric Co. in its research laboratory. Later he was an instructor at Union College. He was granted a fellowship and continued graduate work in the Massachusetts Institute of Technology. In 1924 he became identified with the Rome Wire Co., subsequently joining General Cable.

Mr. Schatzel is the author of many articles in leading scientific publications and has to his credit a number of patents on various types of wires and cables. He is a fellow of the American Institute of Chemists and is active in the committee work of the American Chemical Society and the American Society for Testing Materials. His other memberships include the American Institute of Electrical Engineers, American Institute of Mining and Metallurgical Engineers, British Institute of Metals, British Institute of Rubber Industry and Insulated Power Cable Engineers Association. During World War II he has served

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BEHIND this busy scene, freight elevators are constantly on the job . . . keeping supplies and even the trucks themselves moving on schedule . . . without bottlenecks . . . without confusion.

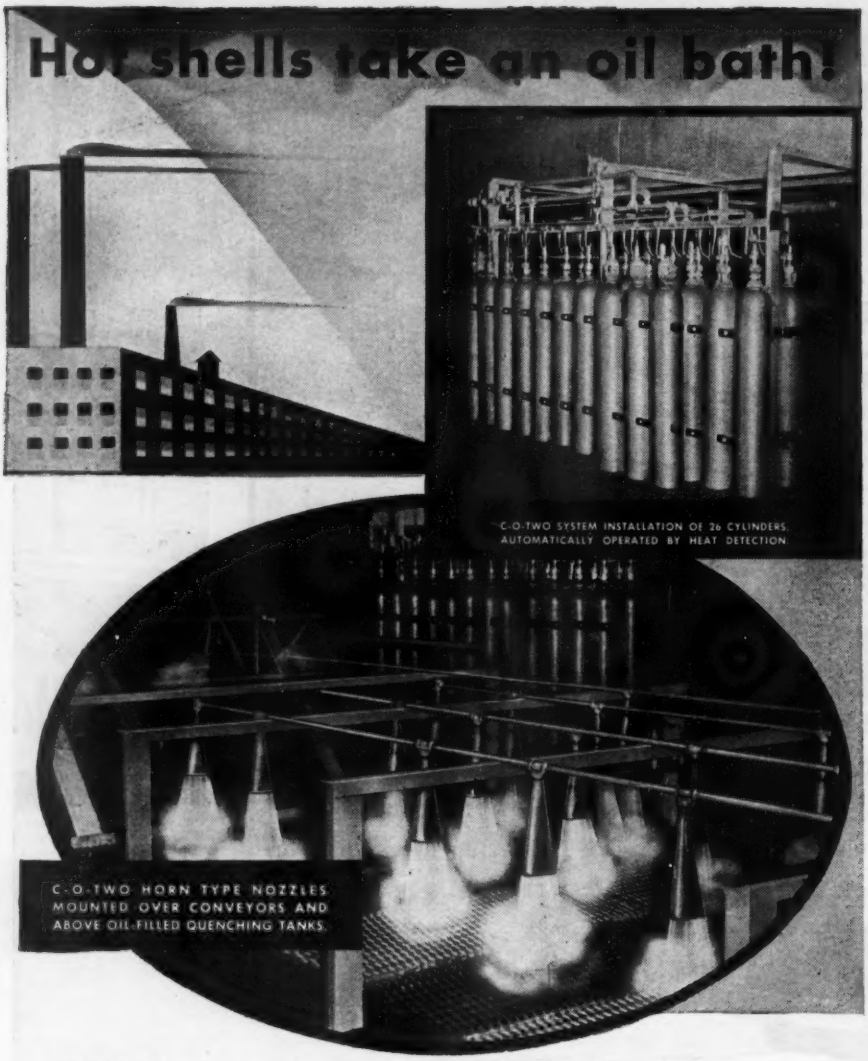
For intensive service, the elevators should be high speed, automatic in operation and provided with power operated doors. Such equipment will compensate for some of the time lost in loading and unloading operations.

If conditions require, freight elevators can be dispatched to predetermined floors to suit any cycle of operation. Also, they do not necessarily require regular attendants.

Your nearest Otis representative is now available to assist you and your Architect in making preliminary elevator plans and studies. For the finest in vertical transportation tomorrow, call your Otis representative TODAY!

Otis ELEVATOR COMPANY
OFFICES IN ALL PRINCIPAL CITIES

Hot shells take an oil bath!



C-O-TWO SYSTEM INSTALLATION OF 26 CYLINDERS, AUTOMATICALLY OPERATED BY HEAT DETECTION

C-O-TWO HORN TYPE NOZZLES MOUNTED OVER CONVEYORS AND ABOVE OIL-FILLED QUENCHING TANKS.

BUT Protected Against Fire

Still red hot on the conveyor belt from heat-treating furnaces, shells for the big guns of the Army, Navy, Maritime Commission and Coast Guard are submerged in quenching tanks filled with flammable oil! During this hazardous process the oil frequently becomes ignited from the glowing hot shells. Every precaution must be taken to prevent a holocaust arising from these conditions. Over this entire process, C-O-TWO fire extinguishing systems maintain a constant vigil, ready at a second's indication of fire to go into immediate action; detecting the blaze, automatically shutting down conveyors and oil circulating pumps while simultaneously releasing carbon dioxide gas which kills fire in its tracks. C-O-TWO does all this in a matter of seconds, for even blazing oil fires cannot withstand the flame killing blasts of dry, sub-zero carbon dioxide gas which stops fire on the spot without damage to any type of equipment or materials.

C-O-TWO carbon dioxide fire extinguishing equipment portables, wheeled units, hose reels and systems are protecting the country's largest manufacturing plants, war industries, arsenals and are used by our Armed Forces on land, sea and in the air. C-O-TWO provides fire protection where lives, time, valuable equipment and vital materials are at stake. Write for information.

C-O-TWO is a Registered Trademark and corporate name of this company. C-O-TWO equipment is fully approved and listed by Underwriters laboratories and Factory Mutuals.

C-O-TWO FIRE EQUIPMENT COMPANY

NEWARK 1 NEW JERSEY

Sales and Service in the Principal Cities of United States and Canada

AFFILIATED WITH PYRENE MANUFACTURING COMPANY

C-O-TWO

as chairman of an industry advisory committee of the WPB and has served as WPB representative on the War Committee for Dielectrics. He was also a member of the National Board of Fire Underwriters Industry Advisory Committee.

•

W. R. Herod Elected Head of International G. E.

W. R. Herod, who upon his recent return after service as a colonel in the Army Air Forces, was made executive vice-president of the International General Electric Co., has just been elected president and a director of that organization.

Mr. Herod succeeds Clark H. Minor, who is retiring after twenty years as president.

•

▶ G. Robert Neubauer, who has been acting manager of Appalachian Electric Power Co. in Lynchburg, Va., since 1942, has been appointed manager. He became acting manager when John E. Jackson entered government service in Washington early in the war. Mr. Neubauer has been with the power company more than 30 years.

▶ Owen Chaney has been appointed superintendent of the Wayne-White Counties Rural Electric Cooperative, Fairfield, Ill., filling the vacancy created by the death of Floyd A. Tannahill. Mr. Chaney has been identified with the co-operative for a number of years.

▶ Rob Roy Macleod, executive vice-president of the Buffalo Niagara Electric Corp., has been appointed to the Civic Full Employment Committee by Mayor Joseph Kelly of Buffalo. He is a member of the Area War Manpower Committee.

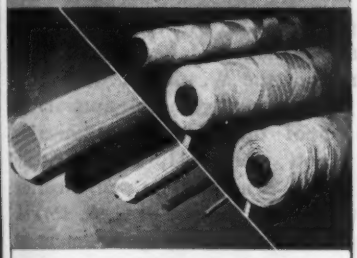
▶ W. Ballentine Henley, a member of the Water and Power Commission of Los Angeles, Calif., has been chosen vice-president of the commission, the position formerly held by Edward A. Dickson, who resigned last year.

▶ O. T. Fitzwater, formerly assistant treasurer of the Indianapolis Power & Light Co., has been elected treasurer. He succeeds the late William C. Richardson.

▶ Ralph Horton has been elected president of the Great American Industries, Meriden, Conn., to succeed Harold W. Harwell, resigned. Mr. Horton will maintain headquarters at New York. Frank W. Watts has been appointed general manager of the com-

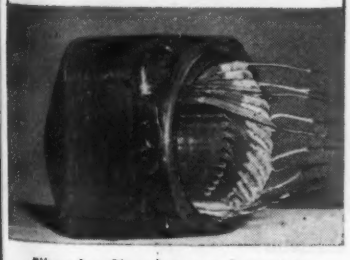
. . . and FIBERGLAS* Sleeving means extra protection here, too

There is a **FIBERGLAS** Insulation Material for every need



Fiberglas Untreated Sleeving, Single, Double, Triple Saturated Sleeving and Varnished Tubing.

Applying Fiberglas Sleeving on coil leads is a fast, easy operation.



Fiberglas Sleeving can be cut to short lengths without fraying. Single Saturated is also widely used on pigtail brush leads, leads on small armatures, single transformers, etc.

Write for catalog EL 44-7, today.

Each distributor of Fiberglas-base Insulation Materials has his own source of supply, since Owens-Corning Fiberglas Corp. does not process these materials.

Designers and manufacturers are using Fiberglas Sleeving in many types of applications to provide extra protection and safety.

For example, it is used on small "potted" transformers for the radio and electronic industries. The Fiberglas Sleeving remains flexible despite the temperature at which the potting compound is poured.

And among the many other applications it is used over the armature coil leads to commutator, protecting the insulation during the soldering or brazing operation. Protection against moisture and rotting is also provided.

Fiberglas Sleeving is available in two wall thicknesses, .008" and .006", furnished plain or treated to minimize fraying. Treatment is in natural color or dyed (blue, red, green, black, brown and yellow). Inside diameters range from 1/16" to ½".

Saturated Sleveing and Varnished Tubing

The specification of saturated sleeving or varnished tubing depends on the dielectric strength required and the flexibility desired.

Fiberglas Sleeving and Tubing are available in several types. C-3 *(Single Saturated Sleevings)* have a light treatment of varnish to keep sleeving round and prevent fraying; dielectric strength is low because of light impregnation. C-2 *(Double Saturated)* have adequate dielectric strength for most applications in motors, are flexible and easy to apply. C-1 *(Triple Saturated)* have higher dielectric strength, greater wall thickness, for use in motors, generators, transformers, etc.

Fiberglas Varnished Tubing has very high dielectric strength. *Magneto Grade* is the highest dielectric braided product available with Fiberglas Yarn base. It is made with a varnish saturant in the braid and several layers of high dielectric film on the outside. In general, *regular grade* varnished tubing is used for all except special, exceptionally high-voltage applications.

Complete Information

The New Fiberglas Catalog EL 44-7 contains performance and application data on all types of Fiberglas Electrical Insulation Materials. Anyone concerned with electrical insulation should have a copy—write for yours today. *Owens-Corning Fiberglas Corp., 1858 Nicholas Bldg., Toledo 1, Ohio.*

In Canada, Fiberglas Canada Ltd., Oshawa, Ontario.

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*T. M. Reg. U. S. Pat. Off.

ARMY E NAVY

ELECTRICAL INSULATION MATERIALS

"Right from the start,

ORANGEBURG'S

a better bet!"

The first hazard in the life of the cable is abrasion of the sheath as it is pulled into the duct. Much abrasive damage to the cable sheath can be prevented by using Orangeburg, because it has a smoother bore, and is made of materials less likely to score or cut the lead-sheath surface.

Furthermore, the act of pulling the cable into the sheath may set up strains which can contribute to shorter cable life. This possibility is lessened with Orangeburg which has a lower coefficient of friction than other duct materials sometimes used.

This advantage also provides protection with cable movement during alternate expansion and contraction with changing loads. Orangeburg's smooth surface keeps sheath wear to a minimum.

As for corrosion, Orangeburg's tight taper sleeve joints and impermeable wall prevent infiltration — and protect the cable from attack by ground water corrosive elements.

Learn more about Orangeburg Conduit by writing for the informative catalog today.

THE FIBRE CONDUIT COMPANY • ORANGEBURG, N. Y.

Graybar Electric Co. Inc. • *Distributors* • General Electric Supply Corp.

ORANGEBURG FIBRE CONDUIT

THE FIBRE CONDUIT CO. ORANGEBURG ORANGEBURG, N.Y.

ORANGEBURG

WITH 50 YEARS EXPERIENCE IN THE MANUFACTURE OF NON-METALLIC CONDUIT AND PIPE, SERVES THE POWER AND LIGHT, TELEPHONE, GENERAL CONSTRUCTION, CHEMICAL, PETROLEUM, PLUMBING AND BUILDING SUPPLY FIELDS WITH ELECTRICAL FIBRE CONDUIT . . . ELECTRICAL UNDERFLOOR DUCT SYSTEMS . . . AND FIBRE PIPE FOR NON-PRESSURE USES.

pany's subsidiary, Connecticut Telephone & Electric division, Meriden, where he will make headquarters, also serving as general manager of the company's subsidiary, Rutland (Vt.) Electric Products division.

▶ L. M. TAYLOR, general sales manager of the Mississippi Power & Light Co., Jackson, was recently chosen regional director of the National Federation of Sales Executives.

•

A. C. Monteith to Direct Engineering Activities

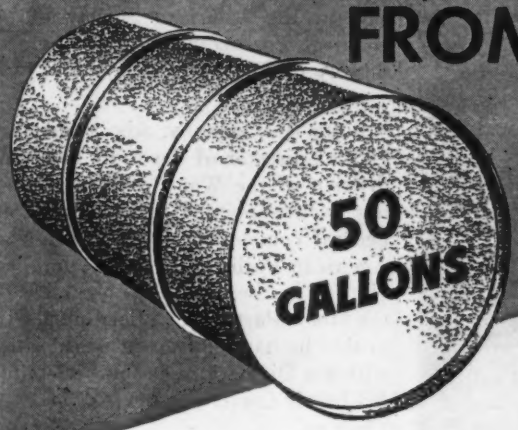
Appointment of A. C. Monteith as assistant manager of headquarters engineering of the Westinghouse Electric Corp. has recently been announced. Manager of the industry engineering department since 1941, Mr. Monteith will direct headquarters engineering activities in the absence of C. A. Powel, assigned to the military government of Germany.

At the same time, Mr. Monteith was appointed director of education. In this capacity he assumes over-all responsibility for student recruitment and training and university relations. These activities will be directly supervised by Charles W. MacLean, whose appointment as manager of the educational department has been announced.

A. C. Monteith

Joining Westinghouse in 1923, Mr. Monteith entered the central station engineering department where he was named manager in 1938. He served in that capacity until chosen to head the industry engineering department three years later. For many years he has played a leading role in the activities of a number of outstanding technical societies. He has been chairman and vice-chairman of several of the national committees of the American Institute of Electrical Engineers and at present

ONLY GETTING 50 gallons OF OIL FROM A 50 gallon Drum?



You get HUNDREDS if you use THE YM OIL RECLAIMER!

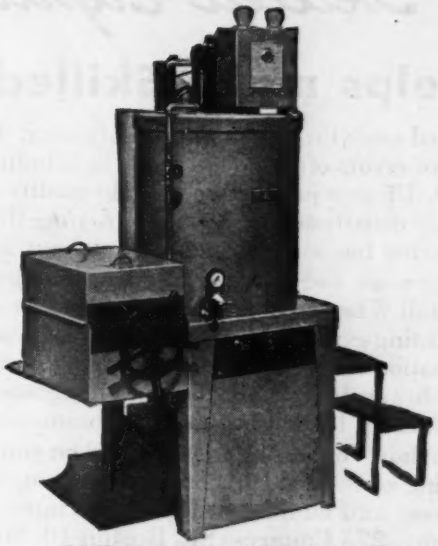
With the YM Oil Reclaimer, you can put used oil back to work...can use it again and again...and it's interchangeable with new parent oil!

The YM Oil Reclaimer completely removes fuel dilution...and moisture too, of course. It removes acids, gum, asphaltic materials. The oil comes out of the Reclaimer clear and sparkling—restored to the original viscosity of the new parent oil.

Oil refined in the YM reclaimer displays outstanding anti-varnish qualities. It cleans—*and keeps clean*—crank cases, valve chests and other places where sludge may collect.

Diesel and gasoline engine oils — transformer oils — cutting oils — hydraulic cylinder oils — these are just a few of the types that can be successfully reclaimed in a YM unit.

We'll be glad to show you how the YM reclaimer can cut *your* oil costs—and to tell you the names of companies near you who *know* what YM can do.



THE YM OIL RECLAIMER
One of the new models of the YM Reclaimer — available in a range of sizes for varying capacity requirements.

THE YOUNGSTOWN MILLER COMPANY

A Subsidiary of
Walter Kidde & Company, Inc.
664 Main Street, Belleville 9, N. J.

Save OIL...and you save MONEY
with the **YM OIL RECLAIMER**
MAIL THE COUPON FOR FULL DETAILS

The Youngstown Miller Company
664 Main Street
Belleville 9, N. J.

Gentlemen:
Please send me further details about the YM Oil Reclaimer—and names of users in this locality.

Name.....
Position.....
Company.....
Street Address.....
City and State.....

THE REFLECTOR IS THE BACKBONE OF ANY LIGHTING SYSTEM . . .

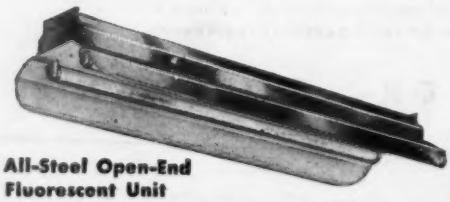
Skilled Lighting!

Helps make Skilled Hands!

Skilled work thrives on *Skilled Lighting.* Down goes the costly record of errors often due as much to blinding glare as uncertain shadow. Up goes production, both in quality and quantity, thanks to evenly distributed, shadow-free *Light* – the kind that Wheeler engineering has made famous throughout industry!

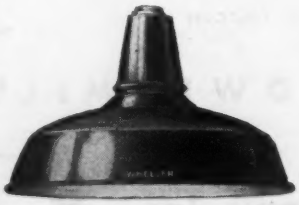
Better work and reduced costs are practically automatic when you install Wheeler Reflectors – the product of 64 years of specialized lighting experience. For they are engineered to get maximum illumination from *standard lamps.* And because of their efficient design, heavy duty materials, and high grade vitreous enameling, they stand up longer, require less maintenance.

Learn how you can lighten the load on your workers – and your operating costs. Send for catalogs showing complete line of incandescent and fluorescent lighting fixtures. **Wheeler Reflector Company, 275 Congress St., Boston 10, Mass.** Also New York. Representatives in principal cities.



All-Steel Open-End Fluorescent Unit

Available for two or three 40-watt, or two 100-watt lamps. Broad wiring channel with accessible, enclosed ballast. Can be mounted from chain or conduit, individually or in continuous runs.



RLM Solid Neck Incandescent Reflector

Maximum lighting efficiency for either indoor or outdoor use. Expertly designed, ruggedly built. 75 to 1500 watts.

Distributed Exclusively through Electrical Wholesalers

Wheeler Skilled Lighting REFLECTORS

Made by Specialists in Lighting Equipment Since 1881

heads its standards committee. Committee chairmanships in the American Standards Association and the National Electrical Manufacturers Association are also held by Mr. Monteith, and membership in the American Society of Mechanical Engineers and the Engineers Society of Western Pennsylvania.

► LOUIS J. CHATTEN, who resigned in July as director of the radio and radar division of the War Production Board, has been appointed vice-president and general commercial manager of North American Philips Co., Inc. After Pearl Harbor he became chief engineer for the Motor Parts Co., Philadelphia. Prior to that he had held executives positions with the Dictograph Corp., Fada Radio & Electric Corp., and Bendix Home Appliances.

► R. W. BEARD has been appointed manager of the electric utility division of General Electric Co.'s central station divisions. The electric utility division, formerly known as the customer division, will have general over-all responsibility for promotion and sales operations with all electric utility customers. Mr. Beard has been connected with General Electric since 1923.

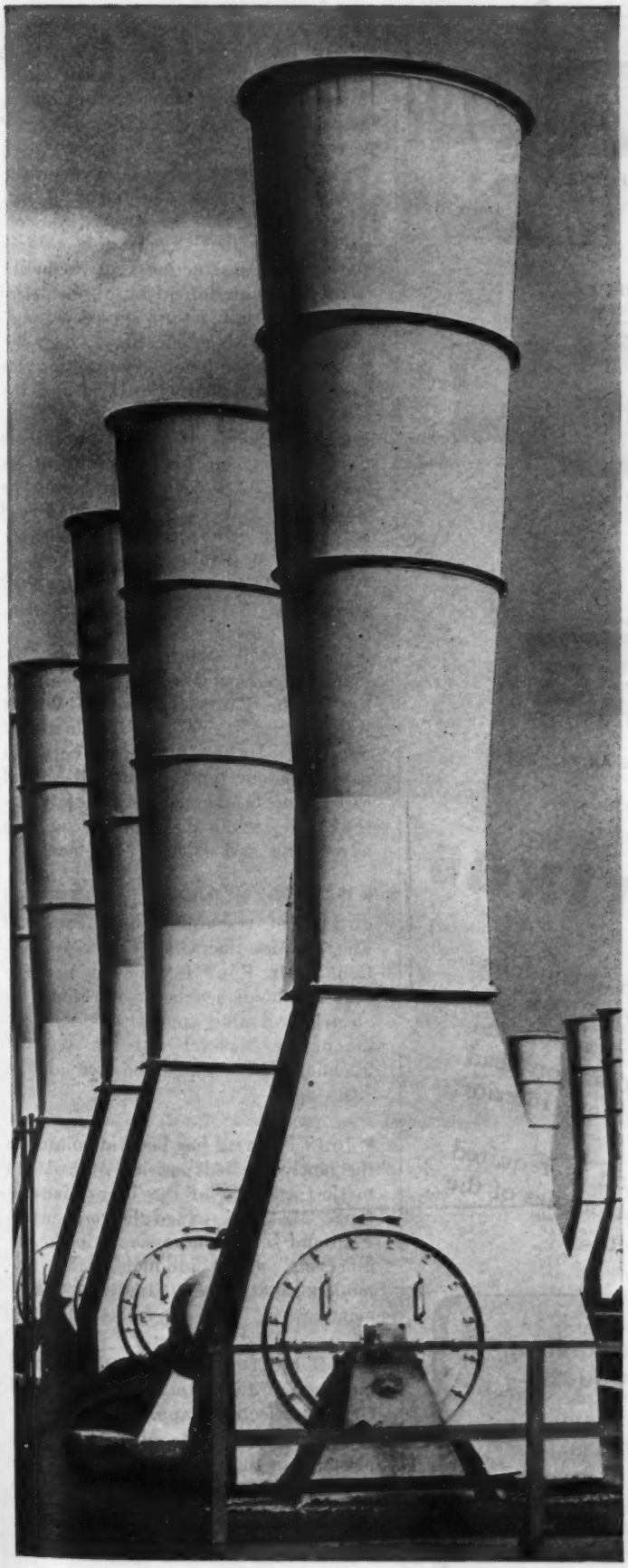
► J. B. TRESCOTT has been appointed St. Louis Rural Electrification Authority representative by the Westinghouse Electric Supply Co. He will be in charge of negotiation of contracts with the REA, leaving his position as midwest district apparatus and supply manager.

► WILLIAM P. VON BEHREN, chief engineer of the Swartzbaugh Manufacturing Co., Toledo, Ohio, for the past eight years, has been elected vice-president in charge of engineering.

► WALTER MOELLMAN has been appointed superintendent of the Elmore, Ohio, waterworks and municipal light plant, to succeed Edward Weis, resigned.

► A. J. BROCK has been appointed manager of the General Electric Co.'s Home Bureau, a technical and advisory service in electric wiring, equipment, kitchen planning, heating and air conditioning, offered by the company to architects and builders. Mr. Brock has been connected with General Electric since 1936.

► ARTHUR SLEPIAN has been named president of the Universal Wire & Cable Co., Ltd., of Montreal, Canada. Mr. Slepian, who recently resigned as vice-president and general manager of the Wheeler Insulated Wire Co., Inc., Bridgeport, Conn., has been active in the lighting and radio fields. During



DIRECT EXACT SIMPLE

INLET BOXES + I. D. FAN + BREECHING + SELF-SUPPORTING STACK

built, tested, installed as a unit

= THERMIX STACK

DIRECT . . . because the path of flow is an almost straight line from the bottom inlet to top discharge through a highly efficient I. D. fan.

EXACT . . . No longer is it necessary to estimate draft losses due to breechings, bends, inlet boxes, nor the effect of natural draft. No safety factor for these causes is required. You call for and get the exact draft desired for the boiler.

SIMPLE . . . since it is usually installed at the boiler outlet, reducing breeching, design and purchasing costs.

THERMIX ENGINEERING COMPANY

Project and sales Engineers

FIRST NATIONAL BANK BLDG., GREENWICH, CONN.

PRAT-DANIEL CORPORATION

EAST PORT CHESTER, CONN.

EXPANSION FITTINGS

To compensate for the expansion and contraction of conduits terminating in a junction box, specify O.Z. Type "EXE". For continuous runs of conduit provide for expansion and contraction by specifying O.Z. Type "EX". Expansion head is sealed against moisture by high grade packing. Interior Bakelite bushings prevent abrasion of cables.

Where a shorter and more compact fitting is required specify Type "AX" which incorporates the principles of the Type "EX" but has fewer parts.

For thin wall conduit (EMT) use our Type "TX". This is the same as the Type "AX" fitting except that it has extending nipples for attaching to thin wall couplings.

O. Z. ELECTRICAL PRODUCTS

- CONDUIT FITTINGS
- CABLE TERMINATORS
- JUNCTION BOXES
- SOLDERLESS CONNECTORS
- GROUNDING DEVICES
- POWER CONNECTORS

8144

O.Z. ELECTRICAL MFG. CO.

262 BOND STREET · BROOKLYN, 2 N. Y.

REPRESENTATIVES IN PRINCIPAL CITIES

the war, he served the War Production Board in an advisory capacity as a member of the radio and radar transformer and fluorescent lighting ballast groups.

▶ H. W. Crowe, Jr., sales manager, Southern States Equipment Corp., Birmingham, Ala., has severed his connection with that organization to join the Oman Construction Co., Nashville, Tenn., as superintendent of electrical operations. Mr. Crowe served as engineer supervising electrical distribution and transmission construction for the Empire Construction Co. and the Georgia Power Co. before his connection with Southern States Equipment Corp. Prior to his appointment as sales manager for Southern States, he was field engineer, service engineer and acting sales manager.

▶ George G. Felt has been appointed advertising and sales promotion manager of the American Transformer Co., Newark, N. J. During the war, Mr. Felt directed personnel relations activities in the Paterson plant of Wright Aeronautical Corp. A graduate of Syracuse University, Mr. Felt, in earlier connections, acquired broad experience in the marketing of industrial and technical products, both in advertising and sales management.

▶ Raymond N. Rowe has been named director of research of the Trumbull Electric Manufacturing Co., Plainville, Conn. Mr. Rowe is a designing engineer and holds a number of patents for electric switching apparatus. A graduate of the Massachusetts Institute of Technology, he joined the company 16 years ago.

▶ John P. Syme has been appointed to the newly created position of assistant to the president of the Johns-Manville Corp. Mr. Syme joined the company in 1926 and served successively in the engineering, power products, sales promotion and market analysis departments.

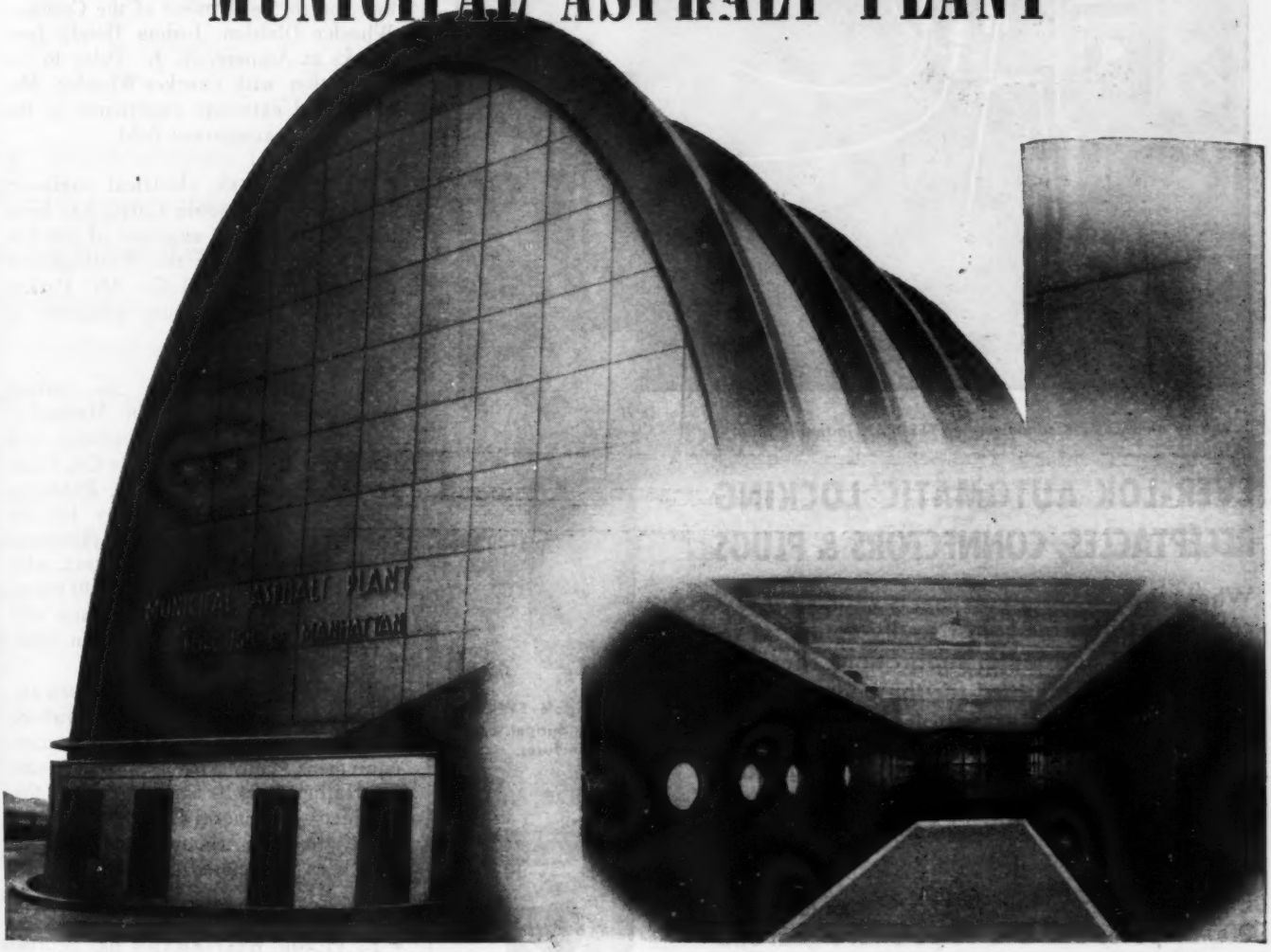
▶ G. E. Mullin, Jr., has been appointed manager of the farm sales division of General Electric's appliance and merchandise department. Mr. Mullin's experience in the farm field has been extensive since joining General Electric in 1925.

▶ George W. Munson, electrical superintendent of the American Tube & Stamping Plant of The Stanley Works, Bridgeport, Conn., has retired. Mr. Munson has been identified with the electrical industry since 1896. He has done considerable pioneer work in flash welding and has also been actively en-

METROPOLITAN'S ELECTRICAL UNIT

FOR HEATING, MOTOR AND LIGHT CONTROL IN THE

MUNICIPAL ASPHALT PLANT

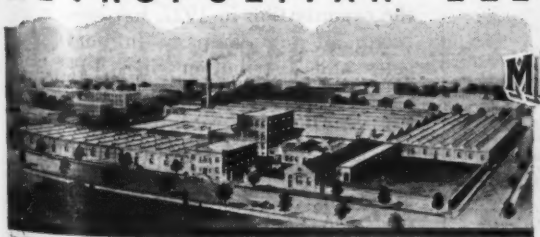


At the right are listed various types of electrical control equipment designed and furnished by METROPOLITAN for utilities, industrial plants, large mercantile establishments, and public buildings. Your inquiries are invited.

Knife Switchboards
Circuit Breaker Switchboards
Dead Front Switchboards
Battery Charging Switchboards
Motor Control Switchboards
Explosion-proof Switchboards
Laboratory and Test Switchboards
Control Switchboards
Generator and Distribution Switchboards

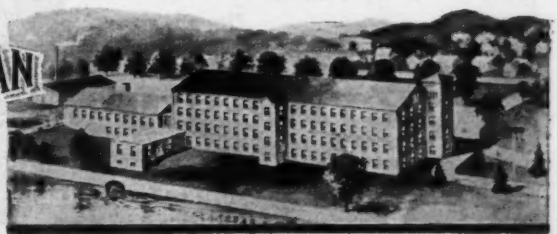
Complete Electrical Control by

METROPOLITAN ELECTRIC MANUFACTURING CO.

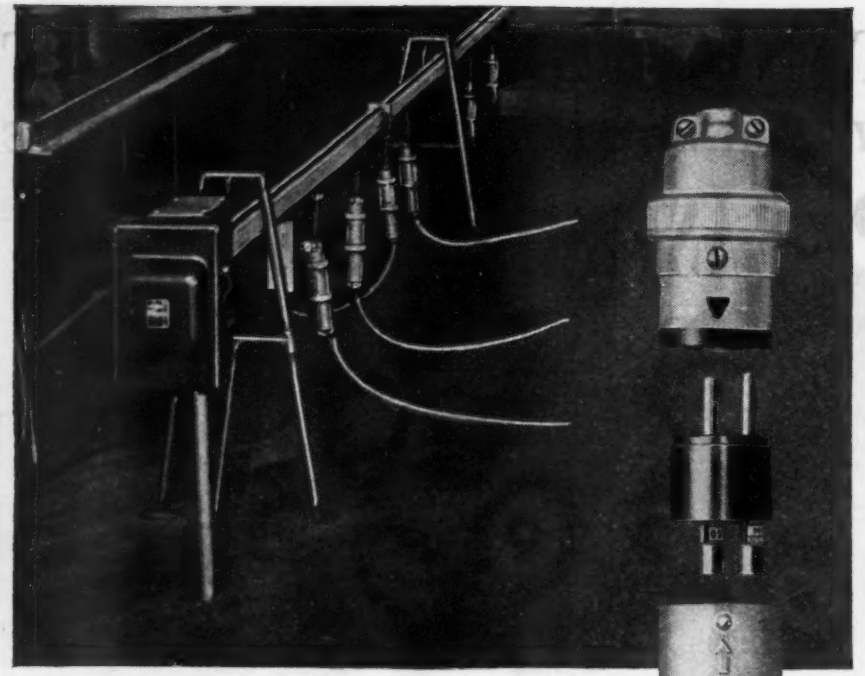


ESTABLISHED 1892
METROPOLITAN
TRADE MARK

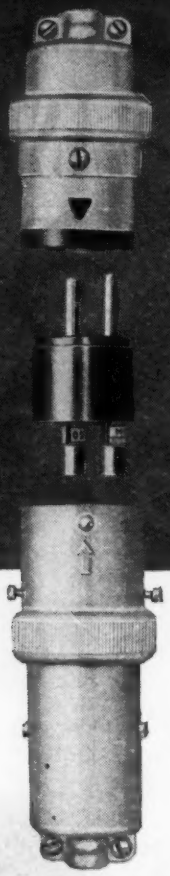
ELECTRIC LIGHTING AND POWER DISTRIBUTION EQUIPMENT



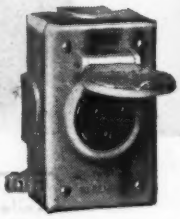
GENERAL OFFICES: LONG ISLAND CITY, N. Y. FACTORIES: LONG ISLAND CITY, N. Y., & WEST WARREN, MASS.



Battery of EVER-LOK connectors on FEEDRAIL in textile plant



2-wire 3 pole EVER-LOK with midget or Busman fuses.



EVER-LOK receptacles, also available in gang type.

EVER-LOK AUTOMATIC LOCKING RECEPTACLES, CONNECTORS & PLUGS

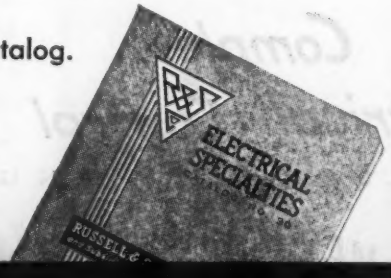
Where uninterrupted service is vital, Ever-Lok connectors insure against faulty contacts, vibration and accidental separation. They are the preferred standard for the connection of high cycle tools and portable equipment.

Locking is automatic and positive. Plugs cannot be inserted the wrong way. Steel clad, dust-proof, self-wiping and self-aligning contacts and positive grounding.

EVER-LOK is made in 2, 3, and 4 pole, 10 to 200 amperes and 2 to 11 pole for signal and control service.

Available in the form of receptacles and plugs for outlet and conduit boxes, surface and gang types, reverse and multiple circuit, weathertight and for cord connectors and also many special modifications not listed in the R. & S. catalog.

Ask for the 300 page R. & S. Catalog.



Since 1902

Please address Dept. No. B

RUSSELL & STOLL COMPANY

EXPLOSION-PROOF, WATER-TIGHT, INDUSTRIAL LIGHTING FIXTURES AND EQUIPMENT. AUTOMATIC LOCKING "EVER LOK" CONNECTORS

125 BARCLAY STREET · NEW YORK 7, N. Y.

33

gaged in experimental work on applications of multi-speed a.c. motors. Mr. Munson joined the American Tube & Stamping Plant in 1903 and continued with the company after it was absorbed by The Stanley Works in 1926.

► E. G. Cross has been appointed supervisor of the production planning and control department of the Crocker-Wheeler Division, Joshua Hendy Iron Works at Ampere, N. J. Prior to his association with Crocker-Wheeler, Mr. Cross had extensive experience in the industrial management field.

► W. W. Parker, electrical engineer, Westinghouse Electric Corp., has been appointed regional engineer of the Rio de Janeiro office of the Westinghouse Electric International Co. Mr. Parker joined the Westinghouse company in 1927.

► William P. Husband, Jr., former commissioner of banks in Massachusetts, has been elected president and treasurer of the Ashton Valve Co., Cambridge Mass., and Ellery Peabody, who has served the company for the past 35 years, has resigned as chairman of the board. J. W. Motherwell, who has been with the company for 40 years, becomes chairman. The company will celebrate its 75th anniversary in 1946.

► R. J. Sherwood has recently been appointed sales manager of Hallicrafters Co., Chicago radio communication equipment manufacturers. Before joining Hallicrafters he was assistant to the president of General Dry Battery, Inc., Cleveland, with which organization he had been associated for the past 15 years.

► F. Victor Westermaier has retired from the Welsbach Engineering & Management Corp. and subsidiaries, to engage in consulting practice to municipalities and utilities with offices at 400 King's Highway East, Haddonfield, N. J.

► Thurlo F. Johnson, who has been with the Norge division of Borg-Warner Corp. since 1933, has been named national service manager, succeeding J. R. Cameron, resigned.

► Joseph H. Ward has been appointed executive vice-president of the Noma Electric Corp. Mr. Ward, who joined the organization in 1927, has been a director of the company in charge of sales and distribution since 1938.

► L. C. Dubs has recently been elected vice-president and general manager of the Canton Stoker Corp., Canton, Ohio. Mr. Dubs has had wide experience in the stoker field.

70/30 for CO_2 and O

A hard-temper, phosphorized deoxidized copper tube that failed in a vent condenser installation was submitted to Scovill for examination.

Localized corrosion was found on the outside surface adjacent to the tube sheet where perforation of the tube wall occurred. The remainder of the tube showed no thinning of either the inside or outside and measurements proved the tube still retained its original gauge.

SERVICE CONDITIONS INDICATE WRONG ALLOY

Further investigation developed that the condensate on the outside of the tube contained relatively high amounts of carbon dioxide and oxygen and that there was mild erosion of the tube surface near the tube sheet where maximum flow of the condensate occurs.

Copper is not recommended where erosion may be a factor, so this customer's problem was solved when Scovill recommended 70/30 Cupro-Nickel tubes. In less severe service conditions, an inhibited Admiralty Metal such as Phosphorized Admiralty would resist this type of corrosion better than the copper tubes originally installed.

SCOVILL SERVES THREE WAYS

This case illustrated two of Scovill's three services.

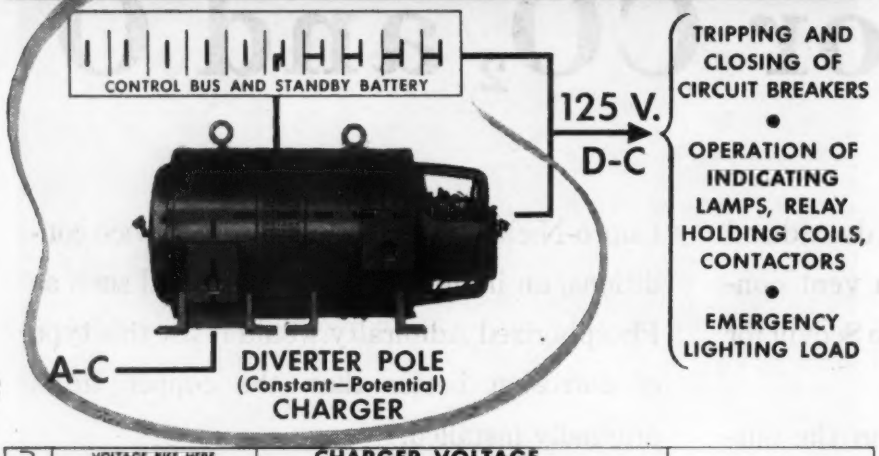
Service in Men provides specialized consultation on tube problems and installation methods. This ties in, as in this case, with *Service in Metals* which covers selection of alloys and study of specific problems in field and laboratory. *Service in Manuals* offers literature on condenser and heat exchanger tubes.

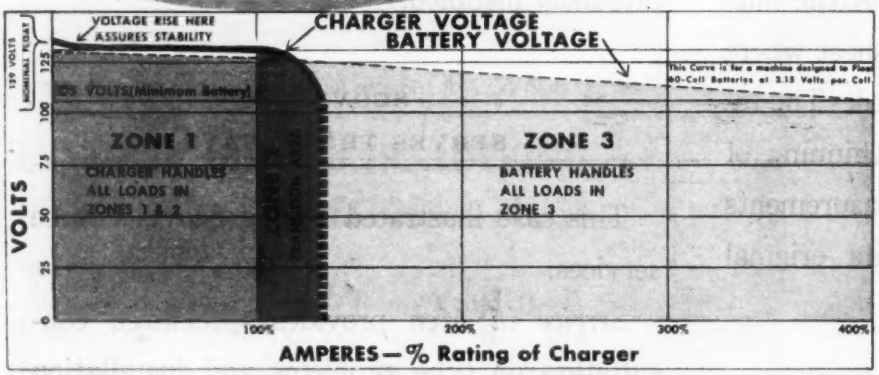
For your copy of the booklet *Scovill Condenser Tubes*, address Scovill Manufacturing Company, 24 Mill Street, Waterbury 91, Connecticut.

Scovill
MANUFACTURING COMPANY
WATERBURY 91, CONN.

CONDENSER TUBES
ONE PRODUCT . . . THREE SERVICES
Service in Manuals . . . Service in Metals . . . Service in Men

They WORK TOGETHER IN proved PERFORMANCE




VOLTAGE RISE HERE ASSURES STABILITY
CHARGER VOLTAGE
BATTERY VOLTAGE
This Curve is for a machine designed to Float 60-Cell Batteries at 2.15 Volts per Cell
125 VOLTS (Minimum Battery)
ZONE 1
CHARGER HANDLES ALL LOADS IN ZONES 1 & 2
ZONE 3
BATTERY HANDLES ALL LOADS IN ZONE 3
VOLTS
AMPERES — % Rating of Charger

ONLY THE "Diverter-Pole" Charger FULLY MEETS BATTERY NEEDS

ASSURING an adequate and uninterrupted supply of direct current (for control bus, circuit breaker and emergency loads) DEMANDS the "teaming together" of only the most dependable Batteries and Chargers. That the "Diverter-Pole" Charger ranks at the top of the list is supported by the thousands of installations made in the past 30 years . . . PROOF that the "Diverter-Pole":

★ **ASSURES MAXIMUM BATTERY LIFE** . . . Only the Constant-Potential method of charging prohibits any chance of over-charging because of too high voltages. Analyze Zone 1, of the above graph.

★ **PROTECTS ITSELF AGAINST HARMFUL OVERLOADS** . . . As shown in Zone 2 of the graph, the "Diverter-Pole" changes from a "constant-voltage" charger into a "constant-current" one, before overloads can become dangerous. The "constant-voltage" characteristic permits the Charger to carry *all* loads within its rating. The change to a "constant-current" characteristic limits the Charger load capacity to its full rating. All excess load is shifted to the "team-mate" battery operating in Zone 3.

★ **GIVES FULL-AUTOMATIC OPERATION** . . . Increasing use of "Diverter-Poles" in isolated automatic and supervisory-controlled substations is convincing evidence that this type of charger needs only infrequent inspection. Its voltage remains constant despite fluctuations in load or a-c power supply.

Before Buying Any Battery-Charging Equipment, Compare Voltage Curves. Ask for Proof of Performance. X-3

● *Diverter-Pole Chargers are available in capacities from 250 watts to 200 kilowatts; in voltages from 5 to 500 volts; and for any standard power supply.*

WRITE FOR DESCRIPTIVE BULLETIN NO. 96-A

EP

ELECTRIC PRODUCTS COMPANY

1731 CLARKSTONE ROAD CLEVELAND 12, OHIO

OBITUARY

Charles E. Carey

Charles E. Carey, regional director of the United States Bureau of Reclamation, with headquarters in Sacramento, died on September 2 in Veterans Hospital, Sawtelle, Calif., after an illness of several months. Mr. Carey was 55 years old. He had been the chief administrative officer of the Reclamation Bureau in northern California since 1943.

Mr. Carey contributed his engineering knowledge and skill to the development of the Skagit River hydroelectric system for Seattle, the Cushman project of Tacoma, and the Chelan development of the Washington Water Power Co. His career was associated closely with the major power and industrial developments undertaken in Washington, Oregon, Idaho and Montana during the decade 1924 to 1934.

During his period of service from 1934 to 1937 as consulting electrical engineer for the National Resources Committee he assisted in preparing the report which was responsible largely for the program and policies subsequently adopted for the development of the great multiple-purpose projects on the Columbia River.

Early in his career he was connected with electrical contractors and private utilities in Texas and Missouri, with the University of New Mexico, Westinghouse Electric Corp. at East Pittsburgh and Seattle, and then he established a consulting engineering practice. It was in 1937 that Mr. Carey joined the staff of the Bonneville Power Administration at Portland, Ore., and during the succeeding five years advanced progressively from rate engineer to chief consulting engineer and assistant chief of the system planning and marketing division. In 1942 he was appointed chief budget examiner of the U. S. Bureau of the Budget, a position he held until he was appointed regional director for the Reclamation Bureau.

•

Henry G. Acres

HENRY G. ACRES, one of Canada's leading hydroelectric engineers, died on September 4 at the age of 65. A native of Paris, Ont., and a graduate of the University of Toronto, Mr. Acres was particularly known for his work in designing and supervising the Chippawa-Queenston development of the Ontario Hydro-Electric Power Commission and the Shipshaw development of the Aluminum Co. of Canada at Arvida, Que.

At various periods Mr. Acres was a consultant for the Hydro-Electric Power

MODERNIZE YOUR PRODUCT *at Low Cost*

WITH THESE INEXPENSIVE, HIGHLY ADAPTABLE SWITCHES

Up-to-the-minute switches add efficiency to the electrical product, that means greater sales appeal to the ultimate consumer. Stackpole line, slide, and rotary-action switches are highly adaptable to the individual needs of a wide variety of electrical equipment and cost but little. Eighteen standard units include 3-position types and 1-, 2-, 3-, and 4-pole switches with or without spring return, detent, covers and other optional features. Each can be adapted mechanically or electrically to meet a wide variety of specific requirements.

OTHER STACKPOLE PRODUCTS

Brushes and Contacts
Carbon Regulator Discs
Bearings—Pipe
Anodes and Electrodes
Packing, Piston and Seal Rings
Welding Carbons, etc.

WRITE FOR ELECTRONIC COMPONENTS CATALOG
. . . for complete details on Stackpole Switches, also Fixed and Variable Resistors, and molded iron cores.

STACKPOLE CARBON COMPANY, St. Marys, Pa.

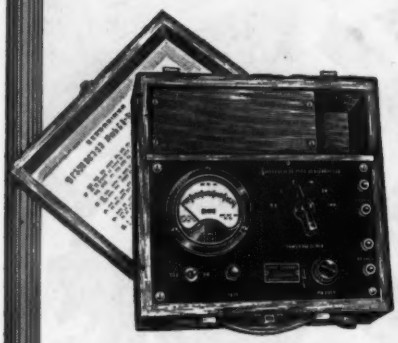
STACKPOLE

Two recent
SHALLCROSS
ENGINEERING DEVELOPMENTS

This convenient No. 759 Kilovoltmeter incorporates several features that make it ideal for either portable or fixed general use. A reversing switch makes it unnecessary to change the terminal connections should polarity be reversed. The built-in meter provides ±2% accuracy and binding posts are provided for an external meter if higher accuracy is required. The meter multiplier section is adjusted within 0.1% so that, when required, more accurate meters may be used with the external connection. This also permits the individual taps of the multiplier to be used as accurate high resistance standards.

New!
5-RANGE PORTABLE KILOVOLTMETER

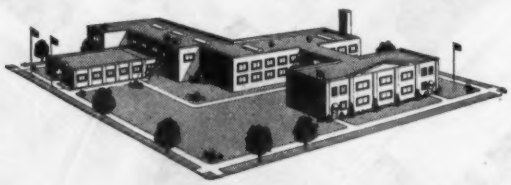
1, 2, 5, 10, 20 kilovolts DC at full scale.



Milliohmmeter No. 673-F is a new addition to the growing group of Shallcross direct reading resistance measuring test sets. Linear scales eliminate crowding of the higher resistance values at one end of the scale. Six scales have ranges of 0-0.5-1-5-10-50 and 100 ohms full scale, thus bridging the gap between the regular Shallcross Milliohmmeters that are extensively used for low resistance testing and the ordinary Ohmmeters used for relatively high resistance measurements. Separate connections are provided for current and potential to minimize the effect of lead and contact resistance when measuring low values. The instrument uses a single #6 dry cell battery carried in a compartment.

New!
MEDIUM RANGE MILLIOHMMETER

Six scales: 0-0.5-1-5-10-50 and 100 ohms full scale



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•

John L. O'Toole

John L. O'Toole, retired vice-president in charge of public relations of the Public Service Corp. of New Jersey, died on September 9 at his home in Newark in his seventy-fourth year.

A former Newark newspaper man, Mr. O'Toole joined the Public Service Corp. in 1909 as a publicity agent. Later he organized the company's publicity and advertising department and in 1917 became assistant to the president. He was appointed vice-president in charge of public relations six years later and in 1938 was elected a director. Mr. O'Toole retired in 1942 as a vice-president of the utility company, but remained as a director until last May.

•

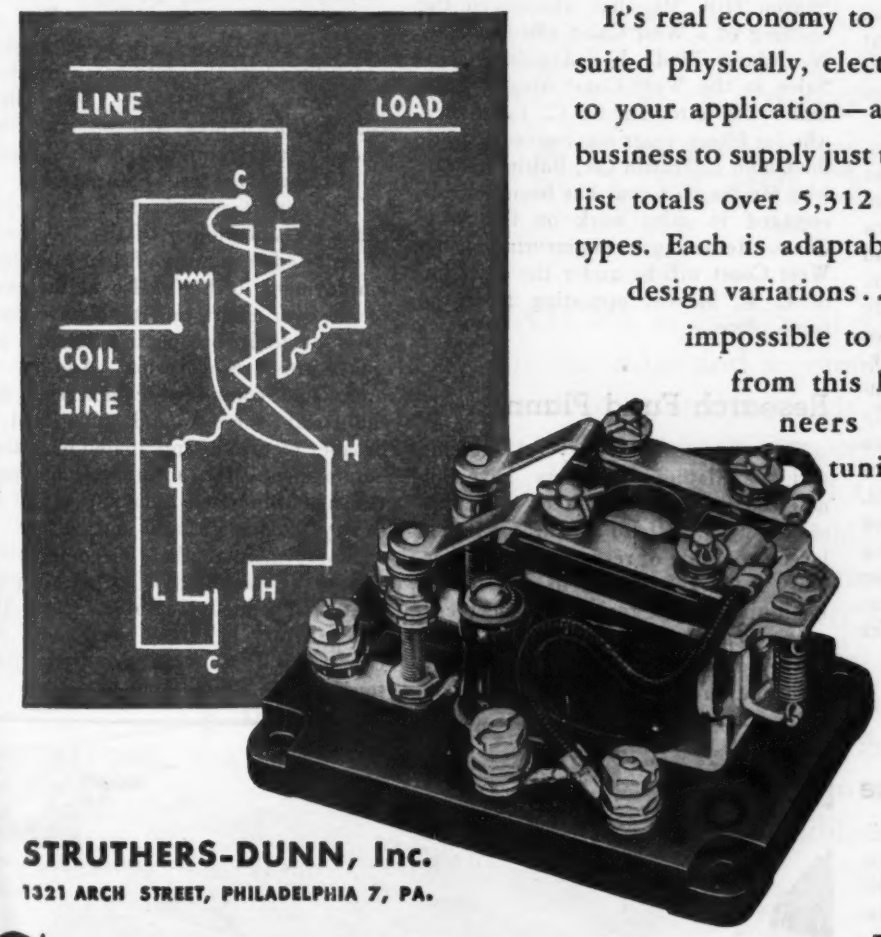
► VAUGHN P. THORP, an electrical engineer for the Bell Telephone Laboratories, Inc., New York, who had been an instructor in radar courses in the company's School for War Training since 1942, died in Ridgewood, N. Y., on September 4 at the age of 51. A native of Warren, Ind., and a graduate of Purdue University, he joined the Bell System in 1919. After serving the New York Telephone Co. in its engineering department, from 1921-34 he was engaged in high-frequency and voice-frequency work for the development and research department of the American Telephone & Telegraph Co. Mr. Thorp joined Bell Telephone Laboratories in 1934.

► HOWARD B. DONALDSON of Watertown, N. Y., a member of the New York Public Service Commission, died on September 4, at Mill Haven, Ont., Canada, his summer home, at the age of 49. Death was due to drowning. Governor Dewey appointed Mr. Donaldson to his position on the commission last March to succeed M. William Bray of Utica. Mr. Donaldson was born in the village of St. Lawrence and was a graduate of Albany Law School.

► ERNEST B. LATHAM, chairman of the board of E. B. Latham & Co., New York electrical apparatus supply house, which he established in 1896, died on September 3 in North Plainfield, N. J., after a long illness. He was 81 years old. Mr. Latham was born in Marlboro, Conn.

FIT THE RELAY TO THE JOB....

NOT THE JOB TO THE RELAY



It's real economy to use relays that are *exactly* suited physically, electrically, and mechanically to your application—and it is Struthers-Dunn's business to supply just the unit you need. Today's list totals over 5,312 standard Struthers-Dunn types. Each is adaptable to numerous coil and design variations... but, should it still prove impossible to match your specification from this list, Struthers-Dunn engineers welcome the opportunity to "tailor" a new relay type to your exact measure.

A typical application of the Struthers-Dunn Type 88XX50 electrical lock-in relay used with a 3-wire "high-low" temperature control thermostat.

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MANUFACTURING MARKETS

Starts $40,000,000 Expansion Program

The initial step in a $40,000,000 expansion program in the United States, Canada and abroad was announced recently by Lewis H. Brown, president of Johns-Manville Corp., with the disclosure that construction had begun near Bound Brook, N. J., on the first of six buildings on a 93-acre plot, which is to be the site of the company's new research center.

Mr. Brown explained that the company had been planning the expansion since 1941 and expressed the belief that the building materials industry now is ripe for rapid development and change both in products and volume. The program, to be financed partly through $14,000,000 specific reserves set aside in the war period and $3,000,000 surplus cash, and partly by a convertible preferred stock issue of $17,000,000 is expected to produce an increase in the company's employment of some 25 percent, possibly by 1948.

Dr. C. F. Rassweiler, vice-president and director of research, in describing the new research center, said that the first unit, costing $2,000,000, will provide "ten experimental factories under one roof."

•

Production Schedules Issued by Westinghouse

Westinghouse Electric Corp., Appliance Division, Mansfield, recently announced tentative production schedules for consumer appliances. These tentative schedules are: electric irons to start August 22; electric roasters, August 27; electric refrigerators about September 15; electric ranges, in the last half of September and the Laundromat, the automatic cycle washer, shortly thereafter.

Small appliances such as electric heaters, waffle bakers, percolators and sandwich grills will be started into production depending on materials and the next two months will see most of them well on the way to peak production. Peak production on the other appliances, J. H. Ashbaugh, vice-president of the Appliance Division, said, is scheduled as soon as enough material becomes available.

•

Opens West Coast Office

Robert Hetherington & Son Inc., Sharon Hill, Pa., has announced the opening of a West Coast office at 5607 W. Adams Blvd., Los Angeles, Calif. Sales in the West Coast area will be under the direction of C. E. Fisher, who for fifteen years was connected with the Glenn L. Martin Co., Baltimore, but who for the past year has been actively engaged in sales work on the West Coast. Hetherington engineering on the West Coast will be under the direction of L. E. Massie, operating from the same office.

•

Research Fund Planned

The American Society of Heating and Ventilating Engineers have announced the appointment of a committee to supervise fund raising for its enlarged program of research at its laboratory in Cleveland and in cooperating institutions. The goal set to meet current research is budgeted at $110,000 for the next three years, Dr. C. E. A. Winslow, president of the society said.

C.E.D. Foresees High Post-War Employment

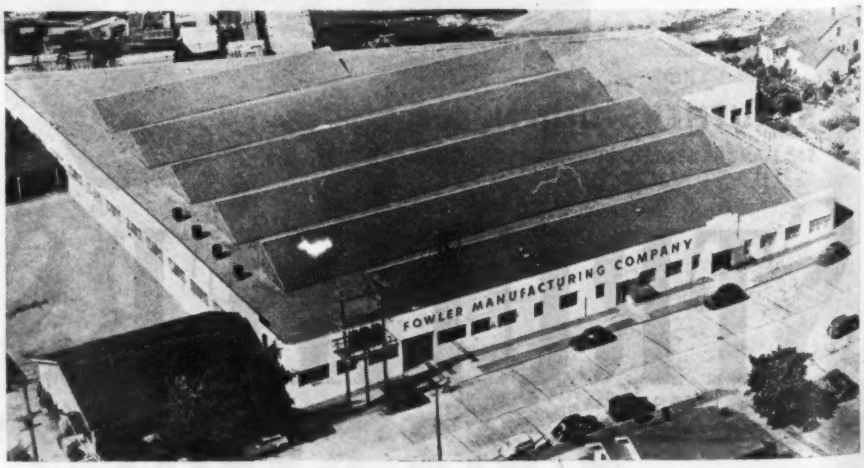
Reports from 100 cities and counties throughout the nation, released recently by the Committee for Economic Development, indicate total employment after reconversion in those areas will be 24 percent greater than it was in 1940. The 100 communities had a total of 3,396,839 workers in 1940 and expect to employ 4,231,623 persons after reconversion has been completed.

In releasing the data Walter D. Fuller, president of the Curtis Publishing Co. and chairman of the CED Field Development Division, said:

"The reports from these communities indicate that businessmen are planning boldly to assure high level, productive employment as rapidly as it can be provided after reconversion. The reports in every case have been checked carefully after the data were received from individual employers. We believe comparable figures will be submitted later by other communities which make up the national CED organization."

The report was broken down into three classifications. Of the 100 areas, 43 reported on surveys of their industrial employment in 1940, also at the peak of the war effort and then gave forecasts of their prospective factory job totals after reconversion. Another 47 areas had completed commercial and industrial surveys and thus had a broader picture of anticipated peacetime employment. Ten additional communities had completed their surveys of industry, commerce and agriculture.

Employment in the 100 communities rose to a total of 4,837,261 at the peak of war production, Fuller said. The cities represent every section of the country and range in size from small towns up to Philadelphia.



NEW PLANT FOR ELECTRIC WATER HEATERS—Fowler Manufacturing Co. has completed construction at Portland, Ore., of a line-production designed plant for the manufacture of porcelain-lined electric water heaters

Specify C-D MICABOND

to speed-up ASSEMBLY . . . .

ARMATURE assemblies fit when C-D MICABOND insulating rings and segments are used. They fit because C-D manufacturing standards assure close tolerance production of MICABOND materials and parts. The consistent quality and accuracy of C-D MICABOND products justifies the confidence C-D MICABOND enjoys from the many manufacturers of armatures who specify C-D MICABOND. When your electrical insulating problem dictates "mica insulation," C-D engineers will be glad to help you to design to use mica to the best possible advantage—and in its most usable form—C-D MICABOND.

KY-45

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DILECTO—A Laminated Phenolic.

CELORON—A Molded Phenolic.

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HAVEG—Plastic Chemical Equipment, Pipe, Valves and Fittings.

The NON-Metallics

DIAMOND Vulcanized FIBRE

VULCOID—Resin Impregnated Vulcanized Fibre.

MICABOND—Built-Up Mica Electrical Insulation.

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Available in Standard Sheets, Rods and Tubes; and Parts Fabricated, Formed or Molded to Specifications.

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WABASH-BIRDSEYE INFRA-RED HEAT LAMPS

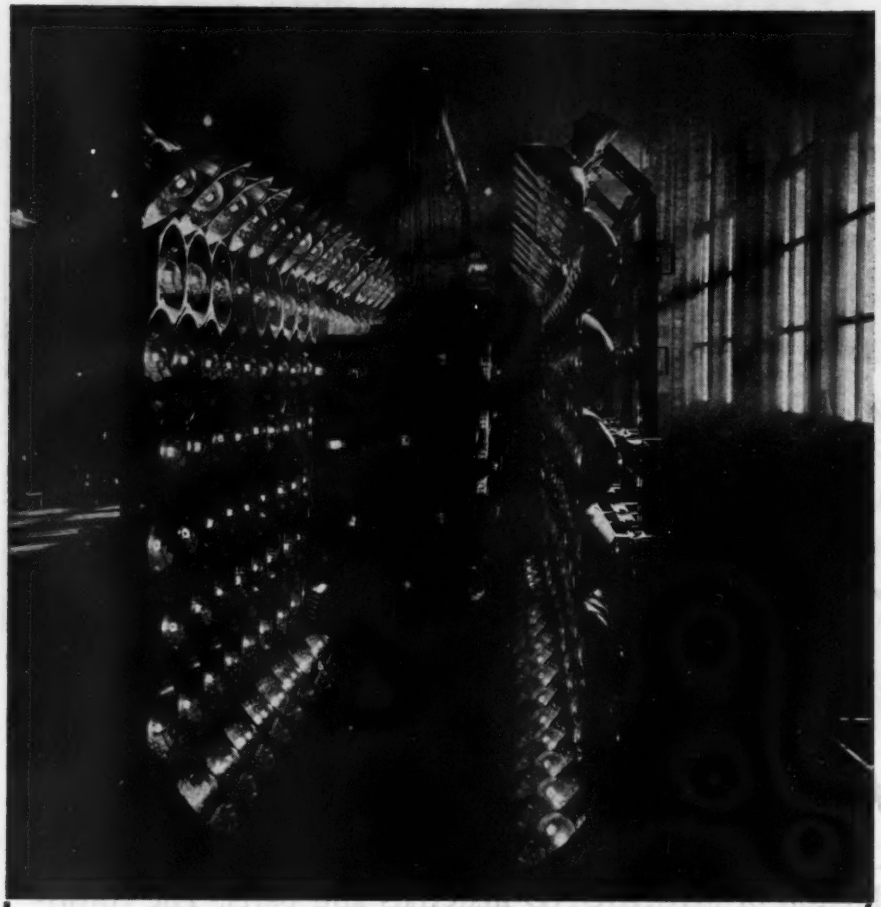

Photo Courtesy Fostoria Pressed Steel Corp.

Save Time: Save Space: Save Money

With old-type methods it used to take 1 hour 15 minutes to bake the finish on stove cabinets in the Queen Stove Works, Albert Lea, Minn. Then forward-looking plant engineers installed Wabash-Birdseye Infra-red Heat Lamps. Now the same operation is done more uniformly, in less space, by one man instead of four—and *in only 15 minutes!* Another dramatic example of the benefits which Wabash-Birdseye Infra-red Heat Lamps—industry's newest tool for baking, drying, dehydrating—can contribute to American industry.

Wabash-Birdseye Infra-red Heat Lamps are standard for most Infra-red tunnels, ovens, and other production line installations. In adapting your equipment to achieve the really dramatic results possible with Infra-Red, remember that Infra-Red heating is a science; and, *for maximum efficiency, Wabash-Birdseye Lamps should be used with scientically engineered equipment.* We will gladly furnish names of manufacturers of such equipment.

WABASH APPLIANCE CORPORATION

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WABASH-BIRDSEYE

First in INFRA-RED

Manufacturers Make Sales Assignments

Electrical manufacturing companies have recently made the following assignments to their sales staffs:

APEX ROTAREX CORP., Cleveland, has appointed Charles W. Rexford central division sales manager. Mr. Rexford will supervise the sale of Apex washers, ironers and vacuum cleaners in eight central states, including Ohio, Pennsylvania, Indiana, Kentucky, Michigan, West Virginia, western New York and southern Illinois. Mr. Rexford joined Apex Electrical Manufacturing Co. in 1942.

EUREKA VACUUM CLEANER CO., Detroit, has appointed George H. Wilkens sales manager of the eastern division, O. H. Golberg sales manager of the western division and George E. Wagner sales manager of the central division. Mr. Wilkins has been with the company since 1938, Mr. Golberg since 1940 and Mr. Wagner joined the organization in 1944.

A. O. SMITH CORP., Milwaukee, has named H. L. Heakin a district representative, covering northern California, Utah and Nevada, with headquarters in San Francisco.

ADMIRAL CORP. has appointed the Sun City Distributors, El Paso, Tex., as exclusive distributors of Admiral radios, refrigerators, electric ranges and home freezers for the El Paso and Albuquerque, N. M., territories.

•

Square D Will Double Milwaukee Plant Size

To handle the anticipated increase in its business, the Square D Co. will double the size of its plant in Milwaukee, F. W. Magin, president, has announced.

"There is every indication that the demand for our types of equipment will continue to increase for some time as industry converts and rehabilitates its producing units," Mr. Magin said. "The outlook is such that we can feel nothing but the greatest optimism for future employment generally throughout the industry."

The company had previously announced that its plants, located in Detroit, Milwaukee and Los Angeles, are virtually converted to normal, peacetime operation.

•

Remodels Plant Offices

Admiral Corp. has consolidated the main offices in its principal plant at 3800 W. Cortland St., Chicago. Space previously occupied at 444 Lake Shore Drive will be taken over in its entirety by Appliance Distributors, Inc., the company-owned distributor of its products in the Chicago area. Extensive remodelling at the Cortland Street plant is still in progress, and when completed

Quality-checked

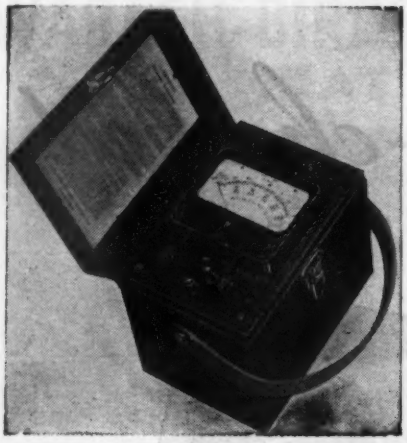
EVERY STEP OF THE WAY

Type DP—a dependable unit for all-purpose applications; quality-checked by continuous production sampling from raw material to finished product. Facilities for producing these units in unlimited volume assure adequate supply at all times.

Capacitances—1000 to 50000 mmfd.; working voltages—120 to 800 d-c; sizes—CN20 and CN35; shunt resistance—50000 megohms at 25°C; P.F. as low as 0.004 at 1000 cycles.

TOBE DEUTSCHMANN CORP. · TOBE · CANTON · MASSACHUSETTS

FIELD OFFICES IN NEW YORK CITY · CHICAGO · DETROIT · GLENDALE, CALIFORNIA



MODEL 201

The Time-Tested, Reliable

VIBROTEST

Insulation Resistance Tester

Since 1938 VIBROTESTS have proven the soundness of this modern method of testing insulation resistance. Superbly engineered, ruggedly built, this pioneer instrument in CRANKLESS INSULATION TESTING offers the utmost in usefulness and value.

VIBROTEST

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No hand cranking, no leveling, no shocks to the operators. Wide range 0-200 megohms covering values usually encountered in general testing are instantly available from a self-contained power source providing a constant potential of 500 Volts D.C. Available in this one compact instrument are a convenient Ohmmeter scale as well as A.C. and D.C. voltage ranges up to and including 600 volts full scale. Other models with 1,000 volts D.C. potential also available.

Many Other VIBROTESTS

are designed for specific uses involving unusual ranges or operating conditions. WRITE for full information at your earliest opportunity.

Engineering Service Representatives in All Principal Cities

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will include a model kitchen, special display and testing quarters, and additional engineering research accomodations.

•

Manufacturers Issue Earnings Reports

Among the electrical manufacturing companies which recently issued reports on earnings are the following:

BORG-WARNER—First half of 1945, net income, $3,528,470, equivalent to $1.51 each on the 2,336,735 shares of $5 par common stock outstanding and compares with $4,091,617, or $1.75 a share for the initial six months of 1944. Provision has been made for estimated adjustments under the Renegotiation Law for the two six months' periods.

SOLAR MANUFACTURING—Peak net sales of $7,681,268 yielded a record net income of $282,555 after Federal income and excess profits taxes in the six months ended June 30, compared with net profits of $213,606 on sales of $7,085,229 in the corresponding six months of 1944. Earnings for the half-year were equivalent, after preferred dividends, to $1.04 a share on 249,239 common shares outstanding and compared with 95 cents a share on 225,000 common shares a year ago. Pre-tax earnings for the latest period aggregated $1,020,775, against $809,632, while net provision for Federal income and excess profits taxes amounted to $738,220, compared with $596,025.

•

Financing Program Voted by Noma Stockholders

Stockholders of the Noma Electric Corp. have approved an increase in common stock from 500,000 to 1,000,000 shares of $1 par value, elimination of pre-emptive rights of stockholders, and convertibility into stock of proposed issues of 4¾ percent convertible debentures and 2 percent convertible notes.

Also approved was the sale by the corporation to Henry Sadacca, president, of convertible notes in the aggregate amount of $600,000 and of a like amount to other officers and employees of the corporation.

Of the increase in common stock, 247,361 shares will be issued to acquire 494,722 outstanding shares of Triumph Industries, Inc.

•

G. E. to Keep War Plant

General Electric Co. plant in White Plains, N. Y., established in 1944 for the manufacture of electric motors for war planes, will remain in that town for the manufacture of electric garbage disposal units for kitchens. Production of the units will begin in October, H. E. Rice, plant supervisor, said.

Appliance Firms Raised Assets from 1939 to 1943

A study of balance sheets of companies manufacturing electrical household appliances and related products for the five-year period, 1939 to 1943, made by the Securities and Exchange Commission has revealed that the 17 firms reporting (18 in 1943) increased their assets from $66,965,000 in 1939 to $117,163,000 in 1943.

In the same period net worth rose from $54,232,000 to $77,301,000 and net working capital from $34,386,000 to $53,262,000.

Dividends showed little change. Figures on preferred stock dividends for the five-year period were $1,490,000 in 1939, $1,622,000 in 1940, $1,530,000 in 1941, $1,222,000 in 1942, and $1,302,000 in 1943. On common stocks the corresponding figures were $4,645,000, $5,442,000, $4,511,000, $3,882,000, and $4,774,000.

•

Quality Control Course Offered by Iowa State

An intensive ten-day course in "Quality Control by Statistical Methods" will be given November 6 to 16 at the State University of Iowa, Iowa City. The course is designed for executives and persons in an advisory position where the knowledge gained can be applied immediately. The course is recommended for quality control supervisors, managers, industrial engineers, production engineers, designing engineers specifying manufacturing limits, persons in charge of specifications for materials and persons responsible for incoming materials.

Applications should be made in advance to Prof. Earle L. Waterman, College of Engineering.

•

"E" Award System Ends; Name Recent Recipients

Army-Navy "E" awards, by which outstanding contributions by industrial plants were recognized, have been ended Robert P. Patterson, Under-Secretary of War, and H. Struve Hensel, Assistant Secretary of the Navy have announced. Awards granted by the Army and Navy Production Award Boards in August will be presented, but no further meetings of the boards will take place.

Among the recent recipients of the Army-Navy "E" award are the following: Handy & Harman, New York, sixth award; and John E. Fast & Co., Chicago.

Those, who use Chromel for heating units or cold resistors, know it to be a product of high uniformity in its good qualities. This uniformity is found in Chromel, as wire that is finer than the hair of your head or as heavy rod and ribbon for hard industrial use. This uniformity, at a high level, is the goal of everything we do, in the foundry, the mill, and the office. Chromel is not an "in-and-outer", but is consistently good. This is the record of the years and our commitment for the future. (Technical data in Catalog-M)

RESISTIVITY @ 68°F		WIRE (C. M. Ft.)	RIBBON (Sq. M. Ft.)
	Chromel-A	650 Ohms	510 Ohms
	Chromel-C	675 Ohms	530 Ohms
	Chromel-D	600 Ohms	471 Ohms
	Copel	294 Ohms	231 Ohms

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PORTABLE
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Field Reports on Business

Peacetime production is being resumed, with new building construction looming as a major activity in the post-war program. Under this impetus sales of sizable amounts of electrical equipment are expected. Rural electrification will also require a substantial quantity of electrical supplies and materials

NEW ENGLAND

Peace-time production is being resumed in New England plants. Textile, rubber, and paper mills are stepping up operations. New building construction looms as a major program here and will stimulate sales of sizable amounts of electrical equipment and supplies. Massachusetts Institute of Technology will start construction of 100 homes this fall in Cambridge and will install electric refrigerators in each dwelling as part of unit kitchen facilities.

Hartford Electric Light is adding to its fuel oil storage capacity at the South Meadow Station. Rural electrification in Connecticut is being actively planned for construction as soon as materials available permit. New England Telephone & Telegraph Co. is conducting a survey in western Massachusetts preliminary to extension there of its services. Stone & Webster Engineering Corp., Boston, has been designated engineers-constructors of a $2,500,000 plant for Florida for the production of turpentine and rosins. Reynolds Metals will construct a $1,000,000 research laboratory on Memorial Drive, Cambridge.

Connecticut utilities are planning to promote household appliance sales as soon as available but are handicapped by the uncertain delivery situation. Resumption of production of washing machines and vacuum cleaners at General Electric's Bridgeport plant is encouraging news for retailers in this area.

Modernization of stores in Worcester, Mass., is very active. Schools and technical institutions are preparing schedules which include electrical equipment of a wide variety suitable for instructional purposes. Motor-generator sets and several small turbo-generator units of about 100 kw. capacity are noted as well as panel board supplies needed for replacements and re-arrangement of circuits better adapted for peacetime civilian instruction. Conversions and additions to small plants in this area are being studied. Pond's Extract Co. will enlarge at Mechanics Falls, Me., National Research Corp., Boston, is to build a dehydration plant in Florida.

NEW YORK

Within the next month or six weeks the investment banking field will probably handle the distribution of a billion dollars or so of new corporate securities in order to avoid conflict with the Government's Victory Loan. September financing alone may well approach the billion-dollar figure.

Civil engineering construction volume in continental United States totalled $30,761,000 for the short week due to the Labor Day holiday. The volume topped that reported for the corresponding 1944 week by 21 percent, but was below the $35,300,000 for the preceding week and was 11 percent below the four-week moving average volume as reported to *Engineering News-Record*. Private construction for the week climbed 546 percent above a year ago due to increased activity in industrial and commercial buildings. Public construction, however, was 45 percent below the 1944 week. The week's construction brought 1945 volume to $1,291,860,000 for the 36 weeks, a 0.4 percent increase over the $1,287,011,000 reported for the similar period of 1944, according to the report.

Retail trade was active last week, estimates putting department store sales in the metropolitan area at from 5 to 10 percent above last year.

PACIFIC COAST

At this distance from major supply sources stock conditions have not yet reflected the cessation of most war work though wire stocks are expected to improve soon due to close of Signal Corps commitments. Conduit, however, is scarce and conduit fittings still more so. Wiring staples were comparatively unaffected by cancellation and overseas bases alone will require much wiring and lighting material for sometime to come.

Industrial developments include a $3,000,000 expansion of Western Crown Cork & Seal at San Francisco; Continental Can plans for an $800,000 plant at Sacramento; an addition to Sherwin Williams in Emeryville; Monsante Chemicals third plywood adhesive plant in Seattle. Paraffine Paint Co.'s $5,000,000 plant expansion in Emeryville will pay special attention to electrical manufacturing facilities.

Southern California Edison is planning much system conversion from 50 to 60 cycles beginning in 1947 to be completed in 1950 and costing $20,000,000.

Orders include poles, arms, wire and hardware for Friant Dam line as a part of California Central Valley project; transformers and transmission line material for Hetch Hetchy connections with Modesto and Turlock irrigation systems; $35,000 of fractional and integral horsepower motors for a pump firm and $65,000 of armatures and generator parts for Mare Island.

CHICAGO

Modernization programs and the relief of overloaded equipment are two types of utility activity expected to get under way soon, but they must await alleviation of the manpower shortage, which shows no signs of abating.

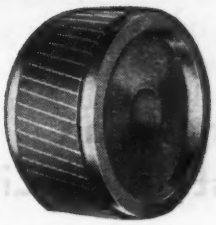
An expansion program is revealed by Benjamin Electric Mfg. Co., Des Plaines, which has erected three new buildings—for manufacturing washing machine tubs and porcelain table tops, and for tool enamel furnace shops. Total square footage is 22,350. A fourth building for research and administration will soon be started. The firm will retain all present employees, reinstate 138 in military service and hire 75 new workers.

Planned installation of a boiler at East Peoria station of the Central Illinois Light Co. has been announced. Rating is 300,000 lb. of steam per hour at 900 lb. pressure and 900 deg. F. total temperature. No building will be required. Work will start in Spring and will be completed by a year from this fall. The installation will not incorporate a turbine.

Pullman-Standard Car Manufacturing Co. plans a $5,000,000 improvement and rehabilitation program.

E. A. Koeneman Electric Co. of St. Louis was awarded a $19,770 contract by the Illinois State Architecture and Engineering Division to install an electric underground distribution system at Peoria State Hospital.

The Only Motor with a *Copperspun* ROTOR



Only in Fairbanks-Morse Motors will you find rotors centrifugally cast in *one piece*—and of *copper!*

The characteristics of copper make it the ideal rotor material. Copper has high electrical and thermal conductivity (twice as good as aluminum), greater strength, and low thermal expansion.

The indestructible copperspun rotor, with its better electrical characteristics, puts the new Fairbanks-Morse Motor far ahead of the times in stamina, in protection, and in versatility.

See a demonstration of what this motor can do for you. Write Fairbanks, Morse & Co., Fairbanks-Morse Building, Chicago 5, Illinois.

Every Good Feature You Could Ask!

Protected Frame—Excludes dripping liquids and falling particles.

Cross-flow Ventilation—Another exclusive feature. Air moves in both directions, providing uniform cooling—no hot spots.

Ball Bearings—Sealed in and protected.

Recessed Conduit Box—An innovation for neat installations in close quarters. Conventional box also provided.

Adaptability—Frame gives protection in any mounting position because the vented bearing brackets can be turned to four positions 90° apart. Reversible frame permits locating conduit box on either side.

Balanced Characteristics—A 40°C. motor with high efficiency and power factor, and excellent starting and accelerating torques.

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Yours for the Asking!

A Guide to Long-Span Low-Cost Rural Lines

Every Distribution Engineer considering ways and means of extending rural lines economically—and *profitably*—will find the contents of this Engineering Manual interesting and valuable.

***Crapo* Steel Conductors are particularly applicable to tap and branch lines which comprise much of the mileage in typical rural systems. Their electrical capacity is more than ample to carry the loads ordinarily imposed on such lines. Voltage drops usually are well within prescribed limits. I^2R losses are insignificant compared with overall savings.**

Be sure to get a copy of this book! A study of its pertinent data will show how and when *Crapo* Steel Conductors can be used advantageously in your rural expansion programs. *Write for your copy today!*

***Crapo* Steel Conductors are distributed by Graybar Electric Company, Inc. Ask the Graybar representative, or write direct, for complete information!**

INDIANA STEEL & WIRE COMPANY · MUNCIE, INDIANA

Sales Opportunities

OKLAHOMA—Oklahoma Gas & Electric Co., Oklahoma City, has approved plans for immediate expansion in Horseshoe Lake steam-electric generating station. New unit will be outdoor-type, consisting of 10,000-kw. turbine-generator, high-pressure boiler, oil-fired, and auxiliary equipment. Work estimated to cost about $2,000,000. Completion is scheduled late next summer. Company also has plans maturing for extensions and improvements in transmission lines, including additional power substations, switching equipment and other operating facilities.

GEORGIA—Mead Corp., Chillicothe, Ohio, plans new pulp and paper mill in vicinity of Macon for production of paperboard. Plant will comprise several one and multi-story buildings, with machinery and electrical equipment. A steam-electric power plant is planned. Entire project reported to cost over $8,500,000. George F. Hardy, 441 Lexington Ave., New York, N. Y., is engineer.

IOWA—Electric Department, Walnut, will receive bids until October 1 for extensions and improvements in municipal power station, including installation of new diesel engine-generator unit, exciter and auxiliary equipment, with switchboard changes and apparatus. Ralph W. Gearhart, 349 21st St., S. E., Cedar Rapids, is consulting engineer.

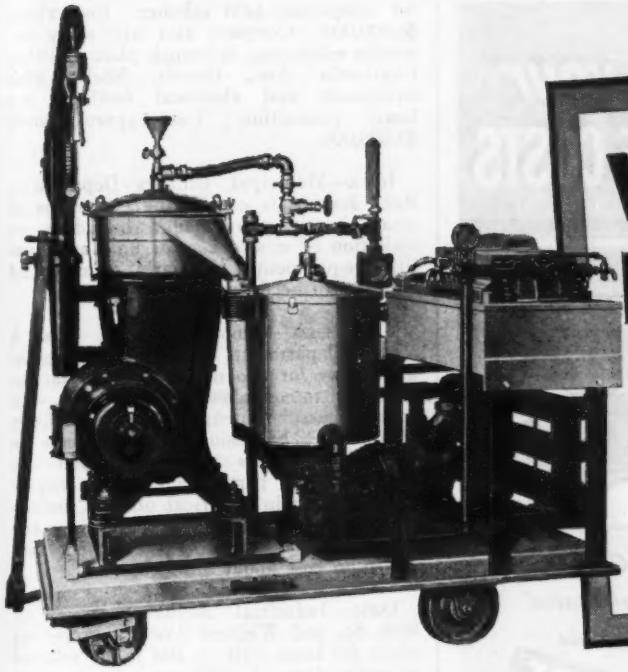
KANSAS—Kansas Power & Light Co., Topeka, has purchased property on U. S. Highway 40, near Golden, and will use as site for new power substation, for which plans will be completed soon. Also will make extensions in transmission lines for connection with new station.

PENNSYLVANIA—Allegheny-Ludlum Steel Corp., Brackenridge, has plans maturing for expansion in plant at West Leechburg, comprising new addition for production of stainless and silicon strip steels, with machinery and electrical equipment. Also will build new laboratory and pilot plant at Brackenridge. Entire program will cost approximately $5,000,000. Work is scheduled to begin at early date.

INDIANA—Light and Power Utilities, Fort Wayne, will begin work soon on new Avondale power substation, and will make extensions in transmission and distribution lines in that area.

LOUISIANA—Newport Industries, Inc., Pensacola, Fla., naval stores, plans new plant at Oakdale, where large tract of land has been selected, consisting of a series of one-story buildings for different branches of production, with machinery and electrical equipment for large capacity. A steam power house is planned. Entire project estimated to cost over $2,000,000. Stone & Webster Engineering Corp., 49 Federal St., Boston, Mass., is engineer and will supervise construction.

PENNSYLVANIA—Edward G. Budd Mfg. Co., 2450 Hunting Park Ave., Philadelphia, steel automobile bodies, has approved plans for expansion in local plant for large increased output, comprising several new one-story buildings. Project is scheduled



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DE LAVAL OIL PURIFIERS eliminate all guesswork about the maintenance of transformer and switch oil. It is not just that the De Laval Oil Purifier employs centrifugal force to remove both water and impurities, but that it employs it *more effectively*. Why?

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Low temperature purification; high dielectric value of oil maintained longer

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Removes water without aid of filter press; press used only to remove colloidal carbon

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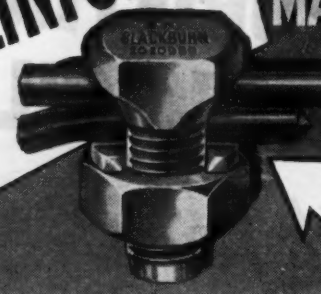

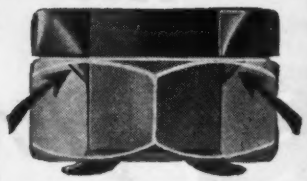

Shown at right is the nut and pressure bar of a BLACKBURN CONNECTOR. Small arrows indicate how this bar is reinforced on both sides. Like the tie rods on a bridge, these two reinforcements greatly strengthen the pressure bar, giving it maximum rigidity and enabling it to distribute the pressure over the entire length of the connection. Thus, the BLACKBURN reinforcing makes a strong connector still stronger, and reduces your maintenance costs!

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BLACKBURN *Hi-Strength* CONNECTORS

JASPER BLACKBURN PRODUCTS CORP.
Main and Clinton Sts. ST. LOUIS 6, MO.

Royal-ettes

#20 in a series of informative letters from a producer of Power Switching Equipment

Our Welcome Mat is out for tough switch problems

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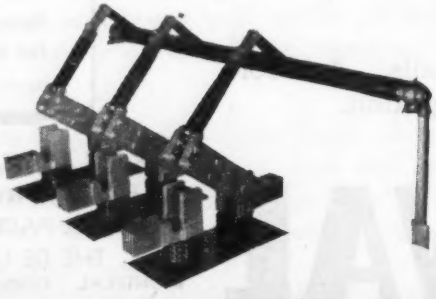
If you can whip the really tough problems the easy ones are duck soup. This isn't always true — but it's close enough.

The photograph below shows a special adaptation of our Type M-1 Indoor Disconnect Switch described on page 223 of our Catalog.

This one carries 3000 amperes. The operating mechanism is simple but tough and effective. However, it wasn't a simple job to design that switch and we traveled a little farther along the road of experience before it was ready to ship.



But we don't say "Now we are over the hump;" — our reputation is maintained by what we do *now* — not on what we did.

ROYAL ELECTRIC MFG. CO. 619 E. 40th Street CHICAGO 15, ILL.

for completion next summer. Cost about $6,000,000. Company also will carry out similar extensions in branch plant at 12141 Charlevoix Ave., Detroit, Mich., with equipment and electrical facilities for heavy production. Cost approximately $3,000,000.

IOWA—Municipal Utilities Department, Rock Rapids, is considering extensions in steam-electric power plant, including installation of new generator unit and auxiliary equipment. Estimates of cost and details will be determined soon.

TENNESSEE—Municipal Light, Gas & Water Department, Memphis, has plans under way for two new power substations estimated to cost about $500,000 each, with transformers, switchgear and auxiliary equipment. Extensions will be made in transmission lines and distribution systems. This is part of a 24-month expansion program in electrical utilities, including line extensions, service connections and other facilities. Entire development estimated to cost about $2,000,000.

OHIO—Industrial Rayon Corp., West 98th St. and Walford Ave., is projecting plans for large mill on site to be selected at early date. It will comprise a group of one and multi-story processing and production buildings, with auxiliary structures for miscellaneous service. Machinery and electrical equipment will be installed for large output. A power plant will be built, with several transformer stations at different points of works. Cost reported close to $25,000,000. Completion is expected late in 1946.

IOWA—Light and Power Department, Webster City, will receive bids until October 1, for new boiler and accessories, rating 40,000 lb. steam per hour, for installation in municipal power plant.

MINNESOTA—City Water and Light Commission, Moorhead, George Duenst, plant superintendent, has extended time of receiving bids for extensions and improvements in municipal steam-electric power plant from September 18 to 8 p.m., October 2, including furnishing and installing new 3,000-kw. turbine-generator and auxiliaries; surface condenser and accessories; switchgear; boiler with rating of 55,000 lb. steam per hr.; stoker; meters and combustion control apparatus, and complete auxiliary equipment. Fund of $712,000 has been arranged for project. Helmick, Edeskuty & Lutz, Essex Bldg., Minneapolis, are consulting engineers.

CALIFORNIA—Paraffine Companies, Inc., 475 Brannan St., San Francisco, linoleum and other composition flooring, paints, varnish, roofing, etc., has plans in progress for expansion in mill at Emeryville, comprising several new one and multi-story buildings, with machinery and electrical equipment. Also will build new steam-electric power plant for service at mill, with turbine-generator, high-pressure boiler and auxiliary equipment. Improvements will be made in present electric operating equipment and facilities in different mill units. Entire program estimated to cost approximately $5,000,000. L. S. Rosener, 233 Sansome St., San Francisco, is engineer.

LOUISIANA—Louisiana Power & Light Co., New Orleans, plans installation of a submarine cable line under and across Mississippi River for transmission service, beginning at point near foot of Henry Clay Ave.

THE BIRD WITH THE 16-MILE TAIL

The wire you see with the parachute on the end of it is a telephone wire, being payed out from a C-47 cargo plane.

Bell Telephone Laboratories, working with the Air Technical Service Command of the Army Air Forces, developed this idea. It will save precious lives and time on the battlefield.

A soldier throws out a parachute with the wire and a weight attached. The weight drops the line to the target area. From then on, through a tube thrust out the doorway of the plane, the wire thrums out steadily — sixteen miles of it can be laid in 6 2/3 minutes. Isolated patrols can be linked quickly with headquarters. Jungles and mountain ranges no longer need be obstacles to communication.

This is in sharp contrast to the old, dangerous way. The laying of wire through swamps and over mountains often meant the transporting of coils on the backs of men crawling through jungle vegetation, and in the line of sniper fire. It is reported that in one sector of the Asiatic theater alone, 41 men were killed or wounded in a single wire-laying mission.

Bell Telephone Laboratories is handling more than 1200 development projects for the Army and the Navy. When the war is over, the Laboratories goes back to its regular job — helping the Bell System bring you the finest telephone service in the world.

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Are contributing a full measure in the drive for producing more — faster — better — and at LESS COST. The choice of discriminating engineers everywhere because they deliver top-notch efficiency and dependability. You get THREE TIMES THE SERVICE and protect production schedules against unnecessary stoppages.

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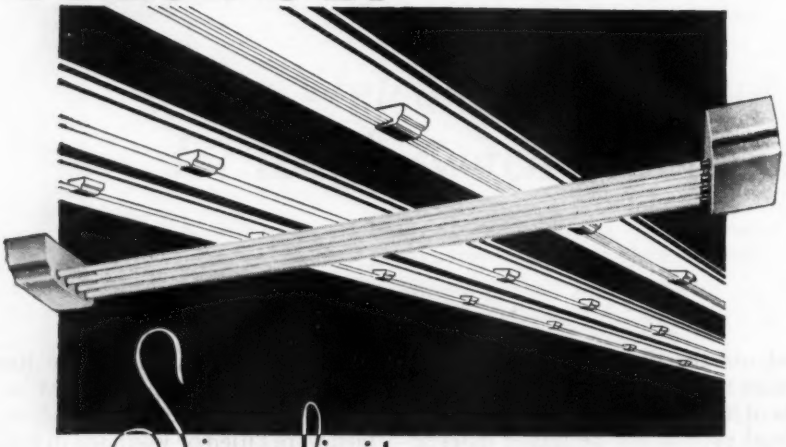

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Long continuous lines of light, possessing all the recognized advantages of Colovolt Cold Cathode Fluorescent illumination, come to you in these "Simplicity" assemblies. Distinctive in design—easy to install—simple to maintain—no gingerbread attachments—no dust collecting areas—"Simplicity" units give balanced illumination with comfortable, easy-to-look-at light for every commercial installation. Units available to make individual 8 foot fixtures or continuous line lighting in multiples of 8 feet. Colovolt 93" 10,000 hour lamps (1) are guaranteed for 1 full year except for failure due to breakage, (2) require no starters—do not flicker, (3) are practically free of intermediate burn outs.

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GENERAL LUMINESCENT CORPORATION

660 So. Federal St. CHICAGO 5, ILL.

Recent Rate Changes

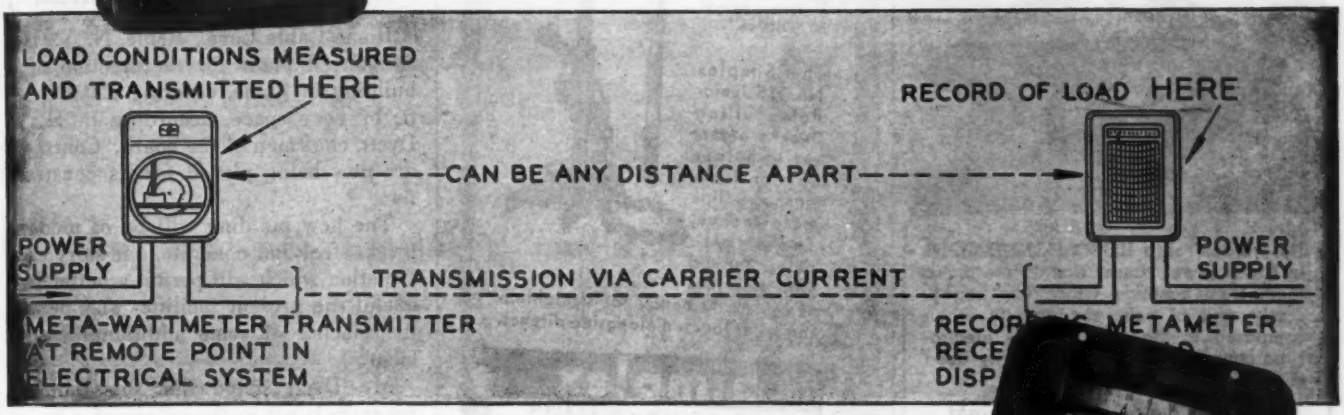
GEORGIA POWER CO. has been ordered by the state Public Service Commission to reduce its residential electric rates for 243,586 consumers from 7.3 to 25 percent. The majority of these customers are in Atlanta and adjacent cities. The new rates ordered by the commission are 3¾ cents per kilowatt-hour for the first 40 kw.-hr. per month; three cents for the next 40 kw.-hr.; two cents for the next 120 kw.-hr. and one cent for over 200 kw.-hr. The minimum monthly bill under the new schedule is only 75 cents per month, or 25 cents less than the present minimum of $1. The reduction, which will result from the reduced rate is from $1 to 75 cents on consumption of 20 kw.-hr. per month; from $1.90 to $1.50 on 40 kw.-hr.; from $3.50 to $3.10 on 100 kw.-hr.; from $5.50 to $5.10 on 200 kw.-hr.; from $8 to $7.10 on 400 kw.-hr. and from $9.25 to $8.10 on 500 kw.-hr. per month. The new schedule is applicable throughout the entire territory served by the company and takes effect with October bills. The average reduction to all consumers is 12.5 percent. In commenting on the new rate schedule, Preston S. Arkwright, chairman of the board of directors of the utility, said in part: "The company is able to accept the new residential rates by reason of the fact that the end of the war will bring a return of electrical appliances to the market within the next few months. . ."

MANITOBA POWER COMMISSION has announced a new low rate for electric power throughout the province with the purpose of attracting badly-needed industry to the smaller centers of Manitoba. Effective from August 1, every town and village on the system, according to the commission, will be given a rate of one cent per kilowatt-hour for all power used over and above 60 kw.-hr. The nominal monthly service charge which heretofore has been in effect will be eliminated. The new rate schedule is 5 cents per kilowatt-hour for the first 30 kw.-hr.; 2½ cents per kilowatt-hour for the second 30 kw.-hr.; and 1 cent per kilowatt-hour for the balance of energy consumed. One hundred and fifty-seven towns and villages now on the system will get the new rates. Users will continue to get a 10 percent discount for prompt payment of their bills.

CLATSKANIE (Ore.) PUD directors have authorized a new schedule of reduced electric rates effective with bills issued after the September meter readings. The reduction amounts to about 12 percent and will mean a saving of approximately $8,500 annually to customers. This is the second reduction made by the district since it started operating in March, 1943. Part of the reduction is attributable to lower wholesale power cost, since the installation of Bonneville's substation at Westport and part is due to increased earnings. The new domestic rates are: first 50 kw.-hr., 4 cents; next 50 kw.-hr., 2.2 cents; next 200 kw.-hr., 1.2 cents; next 900 kw.-hr., 6 cents; excessive kilowatt-hour, ¾ cent; minimum charge, $1.

CONSOLIDATED GAS ELECTRIC LIGHT & POWER CO.'s rate case will be resumed before the Maryland Public Service Commission on October 2 for closing arguments. The case, opened on June 6, 1944, continued until July 10, 1945. While the hearings were being carried on, the commission requested the Federal Power Commission to investigate the Safe Harbor Water Power Corp. and the Pennsyl-

INFORMATION COLLECTED HERE . . .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METAMETER

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Quick analysis of conditions miles away . . . permitting the system operator to act promptly and properly in cases of emergency and to anticipate and prevent abnormalities . . . is made possible by Bristol's Metameter System of Telemetering.

The Metameter operates on the impulse-duration principle, so is well suited for operation over channels commonly available on power systems, including carrier current of either unmodulated or modulated types. A carrier channel, only two metallic wires, or a circuit selected by supervising control can be used to interconnect transmitter and receiver.

Bristol's Metameter for telemetering electrical quantities is described further in Bulletin M1702. Address THE BRISTOL COMPANY, 116 Bristol Road, Waterbury 91, Conn. (The Bristol Co. of Canada, Ltd., Toronto, Ont. Bristol's Instrument Co., Ltd., London N. W. 10, England).

Among uses of the Metameter are:

FOR LOAD DISPATCHER OF CENTRAL STATION SYSTEM

1. Load (active and reactive power and power demand) in each tie-line interconnecting system with neighboring system
2. Output, or total generated power, of each generating station
3. Total output of all generating stations, on a single instrument
4. Active and reactive power and power demand at key points on important transmission circuits
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FOR OPERATOR OF GENERATING STATION

1. Total output generated in system
2. Output of each associated attended or unattended generating station in system
3. Desired output of operator's own station

FOR DISPATCHER OF DISTRIBUTION SYSTEM

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Now . . . a new approach to electrical transients—

with emphasis on pulsed linear networks

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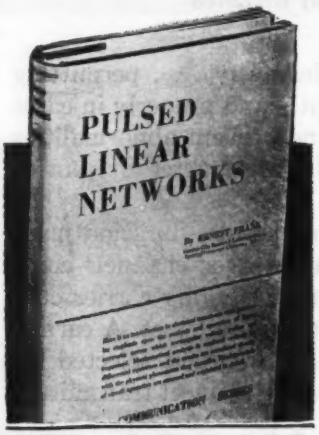

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This book gives you:

—modern emphasis on response of networks to voltage pulses, against a sound background of the classical method of analysis
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—mathematical derivations to clarify the logical development of results

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1. Introduction.
2. Differential Equations and Hyperbolic Functions
3. Series Networks Containing Resistance and Capacitance
4. Series Networks Containing Resistance and Inductance
5. Series Networks Containing Resistance, Inductance and Capacitance
6. Series-parallel Networks Containing Resistance and Capacitance
7. Series parallel Networks Containing Resistance and Inductance
8. Series-parallel Networks Containing Resistance, Inductance, and Capacitance
9. Elementary Applications.

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vania Power Co. The investigation of the Safe Harbor company has been concluded, but the case of Pennsylvania Power is still pending. In the course of the hearings, the Rustless Iron & Steel Corp. filed suit in the Baltimore courts to set aside the commission's decision to consider the Consolidated's rates as a whole, rather than by separate services. The courts, however, upheld the commission.

•

Rome Cable Corp. Will Construct New Building

Rome Cable Corp., Rome, N. Y., has announced plans for the erection of a building in Rome, covering 120,000 sq. ft. of floor space, according to H. T. Dyett, chairman of the board. Contracts are now being placed for its construction.

The new building will be of modern brick, steel and concrete, one-story construction which will permit a better layout of the present facilities and permit the placing of some additional equipment.

Mr. Dyett stated that this building program is not in the nature of a major expansion program, but is to provide better working conditions and facilities for its employees, with ample space to arrange equipment so as to permit more economical manufacturing operations. The new building should be completed during the early winter.

•

Du Pont Plans to Expand Activity in Plastics Field

E. I. du Pont de Nemours & Co. is exercising options to purchase a site of about 400 acres at Washington, near Parkersburg, W. Va., to provide plant space on which to expand the company's activities in the plastics field, Arnold E. Pitcher, general manager of the plastics department, has announced.

In addition to manufacturing Nylon, "Lucite" and Polythene, the last named used in the electrical insulation field, Mr. Pitcher said that out of the extensive research program which the company has been carrying on in the plastics field for many years, several promising new products are expected to be ready for commercial introduction during the five post-war years. The new site will provide adequate space to erect plants for the manufacture of these new products.

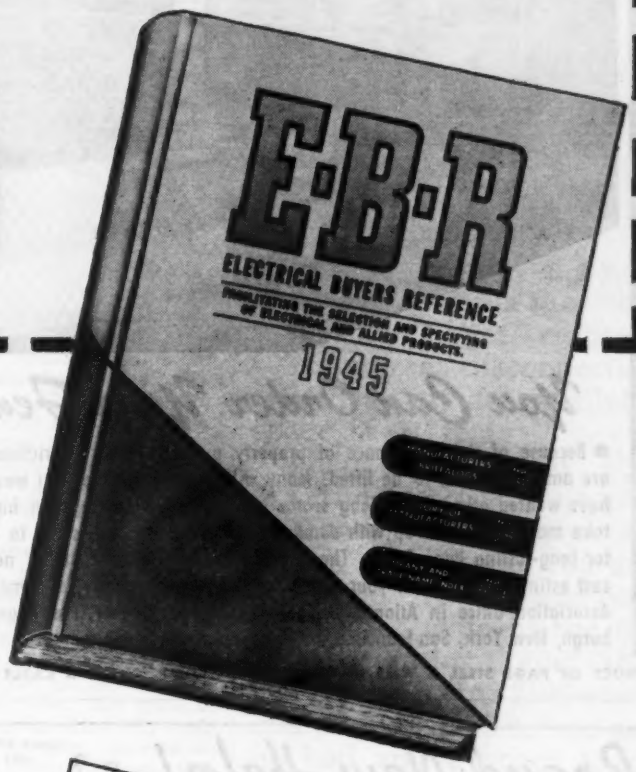
•

Slimline Fluorescent Units

G. E. Lamp Department at Nela Park, Cleveland, has announced it is developing, as fast as possible Slimline fluorescent lamps suitable for use on series circuits.

What's in E-B-R?

E-B-R is *your* electrical reference. It is crammed with information you need in your daily work—information that will answer almost any question about *who* makes *what*. That's why it pays to "look it up first in E-B-R."



There is Briefalog* Data on the Lines of 357 Manufacturers.

There is a Complete Index of all Electrical Manufacturers and all Trade Names.

There is a Detailed Directory of all Electrical Products, and Who Manufactures Them.

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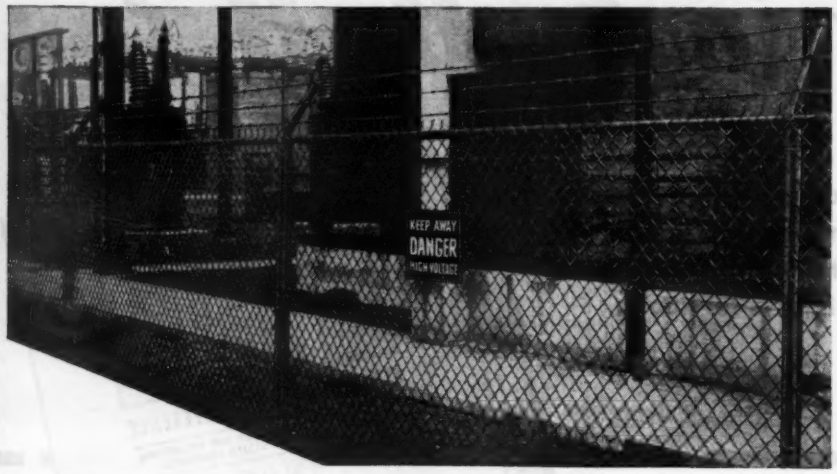

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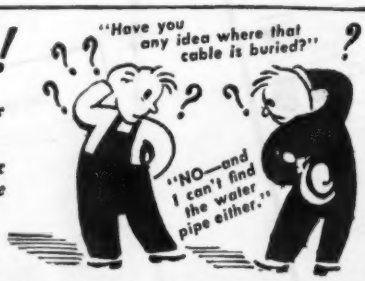

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REA Funds Allotted; Contracts Approved

Allotments totaling $9,164,000 to 42 rural cooperatives in 24 states have recently been approved by the Rural Electrification Administration. Details of the allotments, most of which will be used for line construction to extend electric service, are as follows:

ALABAMA—Coosa Valley Electric Cooperative, Inc., Talladega, $50,000; Pea River Electric Cooperative, Clayton, $50,000.

ARKANSAS—First Electric Cooperative Corp., Jacksonville, $42,000.

FLORIDA—West Florida Electric Cooperative Assn., Inc., Graceville, $392,000.

GEORGIA—Three Notch Electric Membership Corp., Donalsonville, $462,000; Ocmulgee Electric Membership Corp., Eastman, $395,000.

ILLINOIS—Menard Electric Cooperative, Petersburg, $285,000; Norris Electric Cooperative, Newton, $210,000; Southwestern Electric Cooperative, Inc., Greenville, $180,000; Corn Belt Electric Cooperative, Bloomington, $165,000; Tri-County Electric Cooperative, Inc., Mt. Vernon, $125,000.

INDIANA—White County Rural Electric Membership Corp., Monticello, $175,000; Knox County Rural Electric Membership Corp., Vincennes, $30,000.

IOWA—Chariton Valley Electric Cooperative, Albia, $455,000; Pocahontas County Rural Electric Cooperative, Pocahontas, $228,000; Buena Vista County Rural Electric Cooperative, Storm Lake, $66,000.

KANSAS—Ark Valley Electric Cooperative Assn., Inc., Hutchinson, $200,000; Sekan Electric Cooperative Assn., Inc., Girard, $160,000; Sumner-Cowley Electric Cooperative Assn., Inc., Wellington, $160,000.

LOUISIANA—Jefferson Davis Electric Cooperative, Inc., Cameron, $200,000; Southwest Louisiana Electric Membership Corp., Lafayette, $162,000.

MINNESOTA—Crow Wing Cooperative Power & Light Co., Brainerd, $219,000.

MISSISSIPPI—Twin County Electric Power Assn., Hollandale, $275,000.

MISSOURI—Cuivre River Electric Cooperative, Inc., Troy, $383,000.

NEBRASKA—McCook Public Power District, McCook, $250,000.

NEVADA—Alamo Power District No. 3, Alamo, $37,000.

NEW MEXICO—Mora-San Miguel Electric Cooperative, Inc., Mora, $96,000.

NORTH CAROLINA—Carteret-Craven Electric Membership Corp., Beaufort, $50,000.

NORTH DAKOTA—Verendrye Electric Cooperative, Inc., Velva, $515,000.

OHIO—Licking Rural Electrification, Inc., Utica, $150,000; Darke Rural Electric Cooperative, Inc., Greenville, $50,000.

OKLAHOMA—Caddo Electric Cooperative, Binger, $260,000.

TENNESSEE—Lincoln County Electric Membership Corp., Fayetteville, $270,000; Chickasaw Electric Cooperative, Inc., Somerville, $50,000.

TEXAS—Bowie-Cass Electric Cooperative, Inc., Douglassville, $350,000; Lyntegar Electric Cooperative, Inc., Tahoka, $300,000; Tri-County Electric Cooperative, Inc., Azle, $132,000.

VIRGINIA—Powell Valley Electric Cooperative, Jonesville, $250,000 to build substation and transmission lines.

WISCONSIN—Dairyland Power Cooperative, Genoa, $1,250,000 for generating and transmission facilities.

WYOMING—Carbon Power & Light Co., Saratoga, $50,000.

TEST INSULATION
THE MODERN WAY

... WITH A
MODEL B-5

MEGOHMER

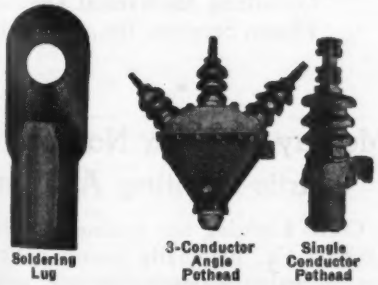
NEW BATTERY-VIBRATOR TYPE

No more tiresome cranking of a hand-driven generator. Entirely self-contained. Steady test potential of 500 volts D.C. available at the touch of a switch. Direct reading in insulation resistance. Various new models and ranges.

Write or phone for Bulletin 430

HERMAN H. Sticht COMPANY, INC.
27 PARK PLACE NEW YORK, N. Y.

ELECTRICAL SPECIALTIES
FOR HEAVY INDUSTRIAL SERVICE
RMC
FROM STOCK



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Construction Contracts Approved

ALABAMA—Sand Mountain Electric Cooperative, Fort Payne, contract to W. L. Coston & Sons, Birmingham, Ala., 22 miles of 3-phase line; labor only, $14,150; engineer, Ladd Engineering Co., Moultrie, Ga.

ARKANSAS—Ozarks Rural Electric Cooperative Corp., Fayetteville, contract to Killoren Electric Co., Appleton, Wis., 242.45 miles of line; labor and materials, $256,983; engineer, Frank Horton & Co., Lamar, Mo.

COLORADA—Union Rural Electric Assn., Inc., Brighton, contract to E. W. Reither, Englewood, Colo., 24.2 miles of line and conversion of 9 miles of line from single to 3-phase line; labor and materials, $35,536; engineer, Rocky Mt. Engineering Co., Denver, Colo.

IDAHO—Northern Idaho Rural Electrical Rehabilitation Assn., Inc., Sandpoint, contract to James C. Roberts, Spokane, Wash., 43 miles of line; labor and materials, $40,832; engineer H. A. Sewell, Newport, Wash.

LOUISIANA—Jefferson Davis Electric Cooperative, Inc., Cameron, contract to Delta Construction Co., Clarksdale, Miss., 33 miles of line; labor and materials, $35,088; engineer, Swanson, McGraw & Hooper, New Orleans, La. Dixie Electric Membership Corp., Baton Rouge, contract to Lamar Advertising Co., Baton Rouge, La., 23 miles of line; labor and materials, $22,873; engineer, Frank Horton & Co., Lamar, Mo.

MINNESOTA—Traverse Electric Cooperative, Inc., Wheaton, contract to Zontelli Bros., Ironton, Minn., 83 miles of line; labor only, $17,812; engineer, A. J. Christopherson, Fergus Falls, Minn.

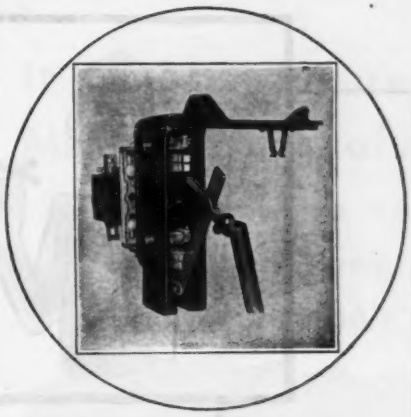
MISSISSIPPI—Magnolia Electric Power Assn., McComb, contract to Line Construction Co., Clarksdale, Miss., 200 miles of line; labor and materials, $166,486; engineer, Bowman & Bowman, Greenwood, Miss. Yazoo Valley Electric Power Assn., Yazoo City, contract to Kincade & Lofton, Brockhaven, Miss., 80 miles of line; labor and materials, $70,453; engineer, Bowman & Bowman, Greenwood, Miss.

MISSOURI—Ozark Electric Cooperative, Mt. Vernon, contract to J. R. Foree, Topeka, Kan., 134 miles of line; labor and materials, $144,251; engineer, Frank Horton & Co., Lamar, Mo. New-Mac Electric Cooperative, Inc., Neosho, contract to J. R. Foree, Topeka, Kan., 125.3 miles of line; labor and materials, $141,113; engineer, Frank Horton & Co., Lamar, Mo. Missouri Rural Electric Cooperative Assn., Palmyra, contract to E. A. Koeneman Electric Co., St. Louis, Mo., 121.12 miles of line; labor and materials, $116,453; engineer, Michael Drazen & Assn., St. Louis, Mo. Callaway County Electrical Cooperative Assn., Fulton, contract to V. W. Lillard, East St. Louis, Ill., 111.6 miles of line; labor and materials, $115,036; engineer, Frank Horton & Co., Lamar, Mo.

TENNESSEE—Gibson County Electric Membership Corp., Trenton, contract to Guy-Townsend Co., Jackson, Tenn., 100 miles of line; labor and materials, $74,873; engineer, Sullivan & McWhorter, Nashville, Tenn.

TEXAS—DeWitt County Electric Cooperative, Inc., Cuero, contract to Gregg Walsh Co., San Antonio, Texas, 110 miles of line; labor and materials, $78,293; engineer, Southwest Engineers, 823 M & M Bldg., Houston, Texas.

WISCONSIN—Richland Cooperative Electric Assn., Richland Center, contract to Honold & LaPage, Inc., Sheboygan, Wis., 45.5 miles of line; labor and materials, $53,880; engineer, Wisconsin Electric Cooperative, Madison, Wis.



400 Ampere, Catalog 475

Compact

A New Jersey engineer had the fallacious idea that he couldn't get eighteen 400 ampere disconnecting switches in an available space of 21 feet.

Then he learned that Matthews Disconnecting Switches were only 3⅞ inches wide in the 200 and 400 ampere ratings and only 4¾ inches wide in the 600 ampere rating, and that they are all rated 7500 volts. His problem was solved and he had ample space to do a neat job.

This is their 17th year of successful service. Thousands are in use all over the country. Send for Bulletin.

Do you want to examine a sample? It will be sent prepaid on request, on loan account.

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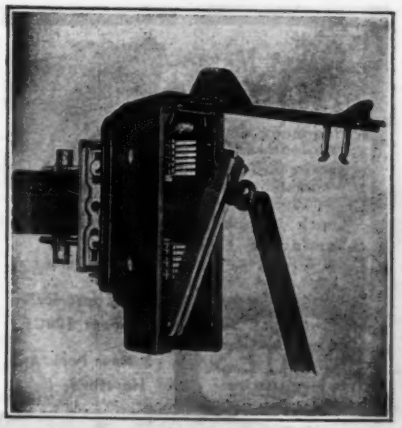
ST. LOUIS, U. S. A.



600 Ampere, Catalog 675

THIS ONE WILL STICK!

Made by the makers of Jenkins Diamond Seal Friction and Rubber Tapes — both of which meet ASTM and Federal specifications.

Remember to get Jenkins Gold Seal Tape and you can forget tape that ravels, smears, and dries out. Quality controlled from base cloth to high-adhesion compound. Wrapped in cellophane and boxed so that you get out of it everything we've put into it! . . . Jenkins Bros., Rubber Division, 80 White St., New York 13, N. Y.

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A high grade fibre board for electrical insulation. A material of quality possessing high tensile and dielectric strength. Used by many of the leading manufacturers of electrical equipment.

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An extremely hard board of superior quality which can replace the more expensive types of insulating materials.

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Socket Meter Test Jack

Has many distinctive features:—
Lever actuated cams hold meter blades firmly
Quick to operate
Laminated base gives strength

See descriptive Sheet 108C1.

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Subox, Inc.

NORTH ARLINGTON, N. J.

LETTER TO THE EDITOR

Use of Metric Measures

To the Editor of ELECTRICAL WORLD:

I was pleased to note the use of metric measures in the article "Power From Ixtapantongo Project for Mexico D F" appearing in your August 4 number. While there is strong feeling among manufacturers and certain other interests in this country against the use of metric measures in the United States, it would appear intelligent for engineers and others to be familiar with important metric units. After all, the metric system is used through the world, with the exception of United States and Great Britain and associated countries.

It would seem wise if technical magazines, in publishing data with respect to plants in countries utilizing metric measures, should express quantities in those terms—with English equivalents if thought desirable. This practice would make the articles more useful to foreign readers, and would at the same time familiarize American engineers with this world system. There will be many millions of young men returning from the war who have become acquainted with kilograms, kilometers, meters, degrees Centigrade and other units.

I understand that *The Scientific Monthly*, published by The Association for the Advancement of Science, is planning to express physical quantities in metric measures, in articles published in that periodical.

Louis Elliott
Consulting Mechanical Engineer
Ebasco Services, Inc., New York

McStay Jackson Named Curtis Lighting Advisers

Curtis Lighting has retained McStay Jackson Co., nationally known designers, to assist in developing new products and keying the company's line to the post-war market. They will supplement the regular design staff of Curtis and will work exclusively with this company in the design of lighting equipment.

McStay Jackson has been active in the design of consumer and industrial products for 15 years and recently received nationwide attention for their use of "Luminous" perforated metal in fluorescent fixture design. G. McStay Jackson is an authority on color.

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Not available for equipment advertising

15 CENTS A WORD. MINIMUM CHARGE $3.00

Positions Wanted (full or part time salaried employment only), ½ the above rates payable in advance.

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Individual Spaces with border rules for prominent display of advertisements.

The advertising rate is $7.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

An advertising inch is measured ⅞" vertically on one column, 3 columns—30 inches—to a page.

POSITIONS VACANT

WANTED: UTILITY superintendent for light, power and water systems by Municipality in Minnesota. Electric distribution experience desirable. P-954, Electrical World, 520 N. Michigan Ave., Chicago 11, Ill.

WANTED: ELECTRICAL Engineering graduate for permanent position as Chief Electrician's assistant in large public utility generating station, located in East. P-964, Electrical World, 330 W. 42nd St., New York 18, N. Y.

RATE ENGINEER — for permanent position with responsible service organization. Good opportunity for qualified man with experience in analysis and design of electric rates. Preferred age 30-45. Must be willing to undertake some foreign travel. Knowledge of Spanish helpful. State salary desired and full particulars in first letter. P-965, Electrical World, 330 W. 42nd St., New York 18, N. Y.

WANTED: GRADUATE Electrical engineer, experienced in either electric or telephone utility operation. Age 30 to 35. Opening will be with State Utility Commission. State age, education, experience and salary expected. Give references. P-963, Electrical World, 520 N. Michigan Ave., Chicago 11, Ill.

WANTED: GRADUATE Electrical engineer with overhead or underground distribution experience. Permanent position with large utility in distribution engineering work. State age, education and details of experience, and salary desired. Include photo. P-976, Electrical World, 330 W. 42nd St., New York 18, N. Y.

RESIDENT ENGINEERS and staking party chiefs experienced rural line construction preferably on REA projects. Permanent work with established engineering firm in midwest. Apply by letter giving full information. P-977, Electrical World, 520 N. Michigan Ave., Chicago 11, Ill.

WANTED: POWER and distribution transformer manufacturer wants an electrical engineer for design work, with or without experience, position open immediately. Write P-978, Electrical World, 520 N. Michigan Ave., Chicago 11, Ill.

SUPERINTENDENT: of municipally owned electric and water utility in a small Wisconsin city. Complete charge of all operations, including office and purchasing. Nonpartisan board managed. Permanent. Give experience, education, age, personal characteristics. P-979, Electrical World, 520 N. Michigan Ave., Chicago 11, Ill.

WANTED: EXPERIENCED electrical draftsman, for drafting and checking in an engineering department of a company located in Eastern Penna. Give age, single or married, education, experience, where now employed, references, date available and salary expected. P-980, Electrical World, 330 W. 42nd St., New York 18, N. Y.

(Continued on the following page)

BOOK REVIEWS

Practical Marine Electricity. By S. N. Le Count and H. S. Dusenberry. Published by The Macmillan Co., New York. 258 pages, illustrated. Price, $3.50.

This self-study book was prepared by two shipyard experts to educate electricians and engineers installing electrical equipment in ships and maintaining the power supply systems in the yards. It deals with the practical aspects of installation of wires and cables and electrical equipment for propelling the ship and powering its cargo-handling equipment as well as the lighting and various communication systems. The latter includes the gyrocompass, direction finders, tachometer, supersonic fathometer, salinity indicator, etc. There is a short textual chapter on degaussing systems. Shipyard substations and machinery are themes of the closing sections.

Transmission Lines, Antennas and Wave Guides. By R. W. P. King, H. R. Mimno, and A. H. Wing. Published by McGraw-Hill Book Co., New York. 347 pages, illustrated. Price $3.50.

Prepared as pre-radar training of military officers this book reflects the improved presentation that comes from frequent repetition before rapidly successive classes. Virtue for most power and communication engineers rests in the avoidance of higher mathematics. Consistent effort is made to show that the newly applied phenomena are not so abstruse that they cannot be related to more familiar manifestations of propagation. Dissipation, impedance-matching, terminations, antenna distribution, stub reversals, detuning sleeves, directivity and gain, arrays and loops are typical topics analyzed in this Harvard text.

The Electrolytic Capacitor. By Alexander M. Georgiev. Published by Murray Hill Books, Inc., New York. 191 pages, illustrated. Price $3.00.

In non-mathematical and non-chemical terms one finds here a discussion of the comparative merits of electrolytic and non-electrolytic capacitors in dry and wet types. The theory of the active film is followed by chapters dealing with the appropriate constituent materials and the methods of fabrication. How characteristics and performance are determined by measurement and test is given in ample detail. Uses in radio sets and in conjunction with motor starting are given in a comparatively brief chapter.

Applied Mathematics for Radio and Communication Engineers. By Carl E. Smith. Published by McGraw-Hill Book Co., New York. 336 pages, illustrated. Price $3.50.

Beginning with algebra, geometry, vectors and hyperbolic trigonometry and passing to the calculus (including transcendentals) and series and wave forms the book has selected and correlated the techniques essential to radio and communication computations. A copious appendix carries definitions, conversion factors, logarithms, Bessel-function tables and a reference compilation of formulas.

Simplified Radio Servicing by Comparison Method. Published by Supreme Publications, Chicago, Ill. 76 pages, illustrated, price $1.50.

Tactics set forth for recognizing and locating troubles should be applicable to carrier and other electronic essemblies in industrial and utility plants, despite the emphasis on radio sets. Comprehensive compilation of tube characteristics.

It's YOUR future—Make the most of it!

Start now to earn the bigger pay in electrical repair

Was there ever such an opportunity to get started in electrical maintenance and repair—and at top-notch wages? Are you ready—with experience and ability—to cash in on it? Others are getting just the sort of background needed—quick! practical!—to handle the great variety of electrical maintenance and repair work TODAY—from this well-known electrical library. You can too!

Electrical Maintenance and Repair Library

5 volumes, 2042 pages, 1721 illustrations

Gives you the "know-how" to tackle any wiring or motor job. Five books show you HOW—to install all types of motor and generator units—to inspect and repair motor starters and generators—to diagnose motor and generator troubles—to figure new windings for old cores, DC and AC windings—to test armature windings, test induction motors, etc., etc. The new book is full of trouble-shooting charts that show quickly symptoms, causes, specific remedies, etc.

Includes trouble - shooting book

Now in addition to four well-known practical books on all details of testing, connecting, rewinding, installing and maintaining electrical machinery, the Library includes Stafford's *Troubles of Electrical Equipment*, a handy book giving helpful maintenance information, special trouble-shooting charts, explanations of symptoms and causes of machinery troubles, specific remedies, etc. This revised library gives you the ability to handle bigger jobs with surety of results.

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Send me Electrical Maintenance and Repair Library, 5 volumes, for 10 days' examination. If I find the books satisfactory, I will send you $1.00 in 10 days, and $2.00 a month until $15.00 has been paid. Otherwise I will return the books postpaid.

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SEARCHLIGHT SECTION

(Continued from page 195)

EMPLOYMENT SERVICE

SALARIED POSITIONS $2,500-$25,000. Reconversion is creating lifetime opportunities now. This thoroughly organized confidential service of 35 years' recognized standing and reputation carries on preliminary negotiations for supervisory, technical and executive positions of the calibre indicated, through a procedure individualized to each client's requirements. Retaining fee protected by refund provision. Identity covered and present position protected. Send only name and address for details. R. W. Bixby, Inc., 262 Delward Bldg., Buffalo 2, N. Y.

POSITIONS WANTED

ELECTRICAL ENGINEER—executive, 25 years broad experience design, construction, purchasing, personnel management. Fully qualified in any supervisory or executive position in electrical field. PW-945, Electrical World, 330 W. 42nd St., New York 18, N. Y.

ELECTRICAL ENGINEER with reliable organization in southern New England. College graduate; 4 years testing and design; draft. PW-956, Electrical World, 330 W. 42nd St., New York 18, N. Y.

PRACTICAL ELECTRICAL Engineer. Age 55, available immediately, over 35 years experience in both foreign and domestic field, sales, construction, layout, material procurement. Address 11966 Weir St., Culver City, Calif.

UTILITY ACCOUNTANT, 25 years experience in operating and holding company and regulatory commission accounting, including 16 years in responsible supervisory positions. Presently employed in administrative accounting position in utility industry. PW-966, Electrical World, 330 W. 42nd St., New York 18, N. Y.

SUPERVISING POSITION wanted: U. S. or foreign countries: Thoroughly familiar with all phases of power plant operation, with production and maintenance. Fourteen years experience with private utility, now with Federal hydro plants using all modern equipment. Best of references. PW-967, Electrical World, 520 N. Michigan Ave., Chicago 11, Ill.

ELECTRICAL ENGINEER—25 years experience on construction and maintenance of substations, A.C. and D.C. automatic stations, and power plant electric equipment. Relay and meter test and related equipment. My present position is assistant test engineer in most vital plant in country. Desire to make change, will go anywhere. Am married and 45 years of age. PW-970, Electrical World, 330 W. 42nd St., New York 18, N. Y.

GRADUATE E.E. Sixteen years electrical construction and maintenance. Last eight years electrical engineer in consulting office. Age 46. PW-981, Electrical World, 330 W. 42nd St., New York 18, N. Y.

ELECTRICAL ENGINEER Wants position. For office and field. Licensed professional engineer, over 20 years broad and unusual experience on power distribution, motor and control applications, switchboards, substations, metering, field inspection, supervision, industrial surveys, reports and testing, valuation, depreciation studies, costs estimating. Excellent references. Will consider supervisory position in electrical field. PW-982, Electrical World, 520 N. Michigan Ave., Chicago 11, Ill.

ELECTRICAL ENGINEER with law degree desires executive position. Thoroughly familiar with ultra high frequency techniques. Seven years experience in industrial chemistry. Three years with office of scientific research and development engaged in electronic research. Age 30. Available January. PW-983, Electrical World, 330 W. 42nd St., New York 18, N. Y.

UNIVERSITY GRADUATE electrical engineering, 20 years supervisory and executive experience in design, test, installation, operation of power, industrial, and distribution apparatus. PW-984, Electrical World, 520 N. Michigan Ave., Chicago 11, Ill.

METER SUPERINTENDENT, eighteen years experience in all phases of electrical metering. Free to move to any location. PW-985, Electrical World, 330 W. 42nd St., New York 18, N. Y.

REPRESENTATIVE AVAILABLE

MANUFACTURERS AGENT and resident engineer. Calling on wholesalers, dealers and industrials in Metropolitan New York offers his services to progressive manufacturer seeking maximum distribution. RA-975, Electrical World, 330 W. 42nd St., New York 18, N. Y.

Research and Development Engineers

Engineers wanted for research work and development of new products by leading manufacturer of electrical transmission and distribution equipment. Company desires men of resourcefulness and initiative who are qualified to work into responsible positions. Positions are permanent and location in Middle West.

P-986, Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

WANTED

Electrical Engineers

PREFERABLY WITH EXPERIENCE IN DESIGN OF POWER OR DISTRIBUTION TRANSFORMERS. MECHANICAL ENGINEER FOR RESEARCH AND DEVELOPMENT WORK. EXCELLENT FUTURE WITH PIONEER MIDWEST TRANSFORMER MANUFACTURER.

P-974, Electrical World
520 N. Mich. Ave., Chicago 11, Ill.

ELECTRICAL ENGINEERS

Experienced graduate engineers wanted by old consulting engineering organization located in New York City. Opening for power station, substation and industrial design engineers. Also distribution engineers thoroughly qualified for economic studies, design layouts, equipment specifications and supervising preparation construction drawings for electric utility systems and industrial installations. Also engineers experienced or interested in training for work on corrosion and cathodic protection of buried metal structures. Applicants please state age, education, experience record, draft status, salary desired, and attach recent photograph.

P-949, Electrical World
330 West 42nd St., New York 18, N. Y.

MECHANICAL, ELECTRICAL AND STRUCTURAL DESIGNING

DRAFTSMEN

And Draftsmen on Hydro-Electric Plants.

P-935, Electrical World
330 West 42nd St., New York 18, N. Y.

WANTED

ELECTRICAL DESIGNERS

Experienced in
DESIGN of POWER & INDUSTRIAL PLANTS
Location N. Y. City

EBASCO SERVICES INC.
2 Rector St. N. Y. C. 6

WANTED

Younger Graduate Electrical Engineer

A large manufacturing concern offers a good position and excellent postwar opportunities to a young engineer unusually well versed in the Science of Electricity who is analytically minded and an original thinker.

Education which includes objective postgraduate study or research and some broadening experience in the electrical manufacturing or utility field are particularly desirable.

The position is one of increasing importance in a department responsible for fundamental research and new developments in the power circuit breaker field.

The location is New England.

Applicants should reply by letter stating qualifications fully, and should enclose a recent photograph. Replies are kept strictly confidential.

P-947, Electrical World
330 West 42nd St., New York 18, N. Y.

WANTED

APPLICATION ENGINEER

For our successful manufacturers' agency selling electrical heating and control equipment to industrials, utilities, manufacturers for resale and jobbers. Requirements include sales aptitude, technical education, four years' commercial experience. Unlimited opportunity. Compensation: salary and bonus. Please write a complete sales letter of yourself.

CARMAN ADAMS
15476 James Couzens Highway
DETROIT 21, MICHIGAN

PRACTICAL ENGINEER and PRODUCTION MANAGER

to manufacture non-metallic sheathed cable and allied products. Permanent position. Good salary and advancement. Location Baltimore. Give all details which will be treated confidential.

P-962, Electrical World
330 West 42nd St., New York 18, N. Y

WANTED

ELECTRICAL DESIGNERS, DRAFTSMEN AND JUNIOR ENGINEERS

on transmission and substation design and distribution system planning. Include summary of education and experience, and photograph in your reply. Location Great Lakes area. Reply

P-946, Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

SALES ENGINEERS

WANTED

Experienced electrical men, familiar with low voltage distribution systems to act as sales specialists in important District Offices on following: Panelboards, safety switches, enclosed circuit breakers, bus duct and load centers. Men accepted to receive full training at factory at company's expense before assignment. Write to Supervisor, Technical Employment, 306 Fourth Avenue, Pittsburgh, Pennsylvania, for application form.

Westinghouse Electric Corporation

SALES ENGINEER

With 16 years design, sales promotion, application and supervisory experience in industrial, commercial, and marine light and power, desires position as executive sales engineer with progressive organization in east. Illumination or composite field preferred.

SA-973, Electrical World
330 W. 42nd St., New York 18, N. Y.